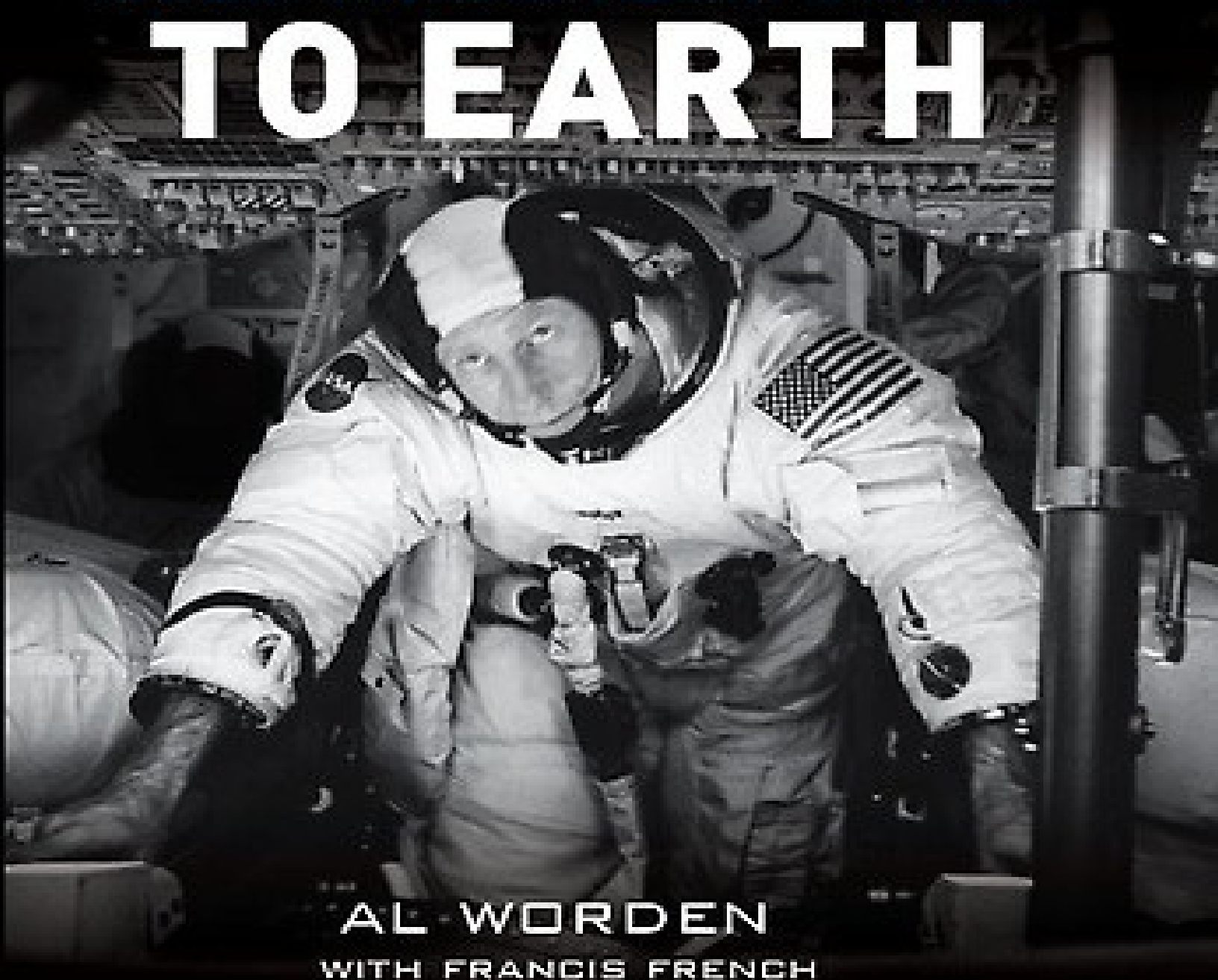


"The command module pilot [CMP], the second in command of an Apollo spacecraft, was the least understood and least appreciated crew member by the media and the general public. In *Falling to Earth*, Al Worden, CMP of Apollo 15, clearly and candidly recounts the wonder, the challenge, the triumph, and the pitfalls of flying to the moon."

—Neil Armstrong, Gemini 8 and Apollo 11 astronaut

# FALLING TO EARTH

AN APOLLO 15 ASTRONAUT'S JOURNEY TO THE MOON



AL WORDEN  
WITH FRANCIS FRENCH



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## FOREWORD

More than anyone I know, Al Worden lives in the moment—in the here and now. It is hard for me to imagine him stopping to reflect long enough to write a book. But I also know that he has been holding in this story for quite a long time.

In this book, Al shares experiences that very few humans have ever had: flying alone on the back side of the moon cut off from all human contact, completely isolated, one of only twenty-four people to have made this journey. I was fortunate to have had that experience as well, and to have been a participant in a significant portion of Al's life.

My time with NASA began with my selection in the third group of astronauts in 1963, a gratifying accomplishment after the bitter disappointment of not being selected in the second group. Al appeared on the scene in the fifth selection in 1966. Although his group may not have realized it at the time, they would play a major role in virtually all American spaceflights from early Apollo missions up to and including early space shuttle flights.

Al's assignment to the support crew for Apollo 9 as a command module specialist and mine as part of the backup crew brought us together, and we continued to train together for the rest of my career at NASA.

During our assignment on Apollo 9, Al and I would spend many hours flying together in a T-38 jet between Houston and Downey, California. When arriving at Los Angeles airport, the two of us would check out our rental cars. We worked different schedules at Downey and needed separate cars. As soon as we left, the race was on—competition was the elixir of our lives. We would generally take different routes to the Tahitian Village motel in Downey. It was always nice to be the one at the check-in desk when the other drove up to the entrance. Of course, we *never* exceeded the speed limit on the way.

Another event that brought Al and me together was a baseball game. Morale was still low in Downey as a result of the Apollo 1 fire in 1967 that killed three of our astronaut colleagues. Apollo 9 commander Jim McDivitt was searching for some way to improve relationships. A game between the crew and Downey workers was suggested. *Game on!* The Downey workers, with their semipro players, prevailed, and a great time was had by all. Morale and the relationship between astronauts and workers improved.

The training period for Apollo 9 was long. With the redesign of the Apollo command module well under way, the crew participated in a tremendous amount of testing. There were many long hours, and a lot of time away spent from home. Al and I worked closely during this period with Dave Scott, the prime command module pilot, to develop specific crew procedures and checklists. Al's contributions were invaluable, relieving Dave and me to participate in mission-specific training and simulations. Apollo 9 finally flew in March 1969 and was a *great* success.

On April 10, 1969 NASA announced the crews of Apollo 12. I was named on the prime crew, along with Pete Conrad and Alan Bean. To my delight, Al Worden was named as my backup. Al was a tremendous help to me during training. Many procedures for working around the moon still had to be developed. We worked together in simulations to develop procedures and checklists for operations in lunar orbit such as mapping, engine burns, and rendezvous. I felt that part of my responsibility was to ensure that Al could fly on Apollo 12 in my place. However, we both knew that this was *not* going to happen. I was going to fly my mission!

I flew to the moon on Apollo 12 in November of 1969. At the conclusion of our postflight celebratory world tour, in the spring of 1970, the Apollo 15 crews were announced, and I was named as backup commander. This assignment gave me my own crew and, I hoped, a later flight back to the moon. But more importantly for me was a chance to work with Al for a third time. This assignment, however, meant that Al and I would not be working as closely as we had in the past, since I was the backup for his commander, Dave Scott. Al had supported me up to and during my amazing adventure to the moon. Now he had his own mission, and busied himself to be well prepared for his extraordinary journey.

As much as Al and I worked together, Dave Scott and I had also developed a close relationship. We had been selected in the same astronaut group and had shared many assignments. I backed him up on Gemini 8 and Apollo 9, then he became the backup commander for Apollo 12, and I in turn became his backup commander for Apollo 15. Assignments together on a total of four crews is probably a record. I wonder how either one of us stood the experience—that's more than enough togetherness.

I know that Al was very happy when he was assigned to Dave's crew. Dave's reputation had been one of the best, and I am sure their backgrounds as West Point graduates—duty, honor, country—provided a strong bond for them.

Apollo 15 became known as perhaps the best of the Apollo program. For Al, in lunar orbit, it included a new bay in the service module housing scientific instruments used to study the lunar surface. He was responsible for operating the experiments for three days around the moon by himself and then performing an EVA, also known as a spacewalk, to retrieve the scientific data cassettes. The EVA took place in deep space, some two hundred thousand miles from Earth. Al completed it in just under forty minutes, a tribute to his training.

After my time as Apollo 15 backup commander, I had no more crew assignments for the first time since 1965, a stretch of more than six years. After working on plans for the space shuttle until January 1972, I retired from NASA and the navy. Soon afterward, I learned that the Apollo 15 crew was in some kind of trouble regarding postal covers. It was an enormous shock to me when three close friends were pulled into a national scandal that sent shockwaves through our tight-knit astronaut fraternity.

I was disturbed by the revelations and concerned about the impact it would have on them. I generally refrain from discussing the event, even today. However, in searching my memory of my work on Apollo 15, I know that I was totally unaware of any unapproved postal covers flown on Apollo 15. I am learning details, from Al's perspective, of this event for the first time.

The episode had a deleterious effect on Dave's and Al's future careers with NASA. It may have diminished their character for a short period of time, but it can never detract from the outstanding work they accomplished on Apollo 15.

I now realize that Al has been holding back the full details of what happened to him almost four decades ago. It has been suggested that the West Point honor code, still part of his character, has

encouraged him to finally write this frank and honest account of all the events of Apollo 15. Now his story is out, and I hope he'll find a peace he has not known for a long time.

After serving some time in private industry, Al has returned to the activity he loves—giving to others through his endeavors. As chairman of the Astronaut Scholarship Foundation he is responsible for the distribution of numerous scholarships to deserving college students around the country, helping America remain a world leader in many fields of science and technology. I'm sure that one of those students will lead something just as important as the Apollo program one day, and that achievement will be thanks to Al's tireless efforts.

With this book you will experience one of humankind's greatest adventures. I hope you enjoy it as much as I did.

Capt. Dick Gordon, USN (Ret.)  
Pilot, Gemini 11  
Command Module Pilot, Apollo 12  
Backup Commander, Apollo 15



## PREFACE

It was the worst day of my life.

I'd had low points before. A failed marriage. Friends dead in car wrecks, aircraft, and spacecraft. This day was almost worse than death. Everything I had worked toward over a lifetime of service was ruined, and I was all alone.

Just a few months before, heads of state had honored me. Congress asked me to address them. I was called a hero. Now I was clearing out my rented apartment, loading boxes into a trailer, and preparing to leave Houston forever. I'd been fired in disgrace and frozen out by my colleagues. I had just lost everything: my career, and the respect and trust of those for whom I would have given my life.

I was angry with myself. I had been involved in something wrong and I knew it. But I was also mad at the world. I had ended up at this low point simply because I had nodded my head at a social evening and agreed to go along with a plan that I had no part in creating. All I had done, I fumed to myself, was trust my colleagues. I had been far too naïve, and now I was an outcast.

That day in the summer of 1972 was the beginning of a long journey for me. As I clawed my way back to self-respect and the understanding of my peers, a sense of duty kept me from telling my painful story of disgrace and redemption. Recently, however, my feelings have changed. If I don't tell this story myself, completely and with raw honesty, then all anyone will know about me will be an incomplete story told only by others. What really happened to me and why? It's time for me to explain.

I'm nearing eighty and, like most aviators, I think I'll live forever. Yet I am told I won't. It is time for me to set the record straight. Along the way, I'll share some adventure stories with you. Flying to the moon is one of the most incredible things that could happen to anyone. I am lucky it happened to me.



## CHAPTER 1 FARMER

Only twenty-four humans have left Earth orbit and journeyed to the moon. I'm one of them. It's an exclusive club, so small that I am still surprised they let me in. After all, hundreds of people have traveled into space. Yet most spacefarers have never strayed beyond low Earth orbit. Our little group traveled a great deal farther—more than a thousand times farther.

The size of our group hasn't grown because no one has returned to the moon. In fact, our number has dwindled to eighteen as my friends and colleagues pass away. I sometimes think we will all be gone by the time humans return there.

We went to the moon in an exceedingly brief span of four hurried years, four decades ago. As time passes, I realize more than ever just how special our experience was. Yet we were not particularly extraordinary people. We just happened to have the right flying and engineering skills when NASA needed to get to the moon. In short, we were lucky.

Even if I had known that there would one day be astronauts, and that I might wish to become one, when I was growing up there was no way of learning how. In fact, when I was born, there were no such people as astronauts, nor rockets able to reach into space. I grew up in a place that was about as far away from that high-tech world as it is possible to imagine: a rural childhood in 1930s Michigan.

My earliest memories are of our tiny farmhouse just outside of the city of Jackson. My older sister, Sally, arrived first in 1931. I was the first son, born within a year. Carolyn, my little sister, came along less than two years after me. For about seven years it was just us three. I think my parents, Merrill and Helen, thought they were done. Then, to our surprise, they produced three kid brothers for us, Jim, Jerry, and Peter, and our big, cozy family was complete.

I was born into a farming family. My mother's parents, Fred and Frances Crowell, lived on their own farm outside of the small town of East Jordan, hundreds of miles closer to the northern tip of the state. I spent so much time there as well as on our own farm that both of them felt like home to me. The weather at my grandparents' farm was much colder and more extreme than at our farm in Jackson, and yet we would journey there every time I was out of school. I remember, when I was very young, my parents drove our Chevrolet sedan north to try to reach the farm in the middle of winter. What a mistake. With no heat in the car, we kids were bundled up in the back seat under a thick pile of blankets. We made it as far as two miles out of East Jordan before the snowdrifts became too high. We had to retreat to town and stay with an aunt until the snowplows could clear the roads.

I learned a lot of family stories when we stayed with my grandparents. Economic times had forced my folks to live on that farm for a couple of seasons. They had married in the late 1920s right as the Great Depression hit. When I was born, money and jobs were scarce in Jackson so my parents moved to East Jordan. I doubt my mother minded the move. She had grown up on her parents' farm and loved

it. She was very much like her mother, and I recall them working side by side every day in the fruit and vegetable gardens. White-haired, heavysset, tough as nails, Grandma Frances was dark skinned from working in the sun all day. She told everyone what to do; she ruled the roost.

But as hard as my mother and grandmother worked, neither of them kept up with my Grandpa Fred, who loved his farm like nothing else in life. Born in Canada, in his youth he worked as a lumberjack, one of the toughest, most physically demanding jobs there is. He might have stayed a lumberjack if a huge tree hadn't fallen the wrong way and crushed his ankle. Although the injury eventually healed, it ended that career.

My grandfather was still in his teens, so he walked over the Canadian border to the northern part of Michigan's Lower Peninsula to stake out and homestead 160 acres of land. He never took out citizenship papers and never dared to revisit Canada, worried he might not be allowed back to the States. But people vouched for him, so he obtained a Social Security number, a driver's license, and everything else he needed, without ever getting caught. He even married the daughter of a German-American family from a farm just down the road. Nevertheless, Grandpa Fred was an illegal immigrant.

Grandpa looked exactly how I imagined Santa Claus would, except without a beard. White-haired with blue eyes and rosy cheeks, he dressed in overalls and smoked a pipe. He had a particular farm smell about him, even when he'd cleaned up after a hard day's work. Warm hay, a dusting of manure, and the heavy odor of fresh milk were all bound together with fragrant pipe smoke. I loved that smell, because I loved him.

He spent his life clearing his farmland. It was not very fertile; tens of thousands of years earlier, glaciers had scraped away the rich topsoil, leaving weak rubble-filled dirt in their wake. But Grandpa was persistent; it was him versus the rocks in his fields. I would help him with his team of horses as they pulled a low, flat trailer with skids called a stone boat. With it, he methodically picked up rocks and stones, slowly improving the land.





*My Grandpa Fred, a lifelong farmer*

A gentle soul, Fred greeted the world with a jolly smile. People can sense a nice person; so can cows. He had all of his dairy herd named, and when he called Bessie, Hazel, and Mabel, they would eagerly come to him. He always had a little treat in his pocket for them, and for his horses, too. Even the feral cats loved him. Wild and wary, they were only tolerated because they caught rats. But when Grandpa milked a cow, the cats would approach him mewling, and he'd squirt milk right from the teat into their mouths.

Grandpa was part of a community of poor but supportive farmers. At harvesttime, if another farmer was short-handed when the time came to thresh wheat and oats or to raise a new barn, he could count on Grandpa. I wanted to be just like my grandfather when I grew up. He had no money to speak of, but acted as though he was a rich man. And he was. Rich in contentment, he was happy with who he was and what he did. I especially admired his independence. He was very social and loved by everyone, but he didn't *need* anyone else to be happy. He just—was.

I loved being with Grandpa. My own father had a more difficult time on the farm. Living on that farm was his idea of hell. I later learned how depressed he'd been by the forced move. He hated farm work, and it showed. My grandparents noticed, and grew increasingly unimpressed with his rejection of their farming life. I was sad to hear stories of my father so out of his element and unhappy. Circumstances had parachuted him into my mother's family without any support. They had grown up with one set of rules in life. His were entirely different.

My father looked typically Dutch—pale, with white-blond hair in a brush cut. He was six feet tall and chubby all his life. The whole town of Jackson knew him, and what did they call him? Tiny. It was a loving tease. He was unremarkable, the kind of man who could blend into a crowd: pleasant to everybody and comfortable to be around. This softhearted, jovial guy always had a twinkle in his

large blue eyes.

Orphaned at the age of four when his parents died in a car accident, my dad was raised by his gruff Uncle Dick on a pig and apple farm in northern Michigan. He'd had enough of farm life by the time I was born. Growing up, I saw him as a gentleman farmer, the type who owns a farm but never works on it. Dad was more technically oriented; his life revolved around electronics. He owned a small repair shop in Jackson and was good at fixing radios. In fact, my dad built the town's first radio station, and worked for a while as the late-night talk host. He was curious to see how far he could boost the radio signal from the station, and had his answer one day when he received a postcard from a listener—in Australia.

My father's electrical work earned the family a little money, and he enjoyed his machines and the slow, careful work of repairing. A bit of a dreamer, he had lots of ideas that he wanted to develop. He even designed and built a tape recorder and player long before they were commercially available, but because he tinkered away by himself, nothing ever came of it.

Before I was born, Dad had helped to install the projectors and sound system in Jackson's big movie theater downtown. While he worked as the projectionist, my parents lived in an apartment over the theater. This was the kind of life he enjoyed: studying electronics and taking exams. After he spooled up a projection reel, he had a precious half hour of undisturbed study time before he needed to change it over. But then came the Depression. People in Jackson gave up luxuries like movies. To my father's despair, the movie theater shut down for many years, forcing him back into farming.

My father didn't ask too much of us kids. He would discipline me on occasion, but it wasn't his nature. My mother was the strict one. She ran the family, while Dad worked in town. Short and dark-haired, she was a loving, supportive parent. Yet she could also be sharp edged, sharp tongued, and demanding. This wasn't a bad thing. She had high expectations and she pushed us kids hard. When her dark eyes fixed on me, I immediately thought about what I might have done wrong.

Considering her tough upbringing, I could hardly blame her. She was a farm girl, reared in the country with no modern amenities. She grew up a hardy pioneer. The Depression was just another kick in the teeth. No matter how much her life improved after that time, she always thought, dressed, and acted the same. Her hair was tied back or cut short, her clothes practical, and she met the world head on. Life is hard, she would tell us—it takes a lot of work to get someplace in life, and you kids will start *right now*.

My mother was working in Jackson as a secretary when she met my father. I'm told my father was kind of a dandy. He strutted around in white suits and changed his shirt about three times a day. Why that pretty young woman chose him, I'll never understand. I do know my mother thought she could change him into a hardworking farmer, pitching hay ten hours a day. That never happened because he never stopped being a city guy.

When the movie theater reopened at long last and my father had steady paid work again, he gave his paycheck right to my mother. She took care of all the money. That arrangement worked well; otherwise he'd fritter it away on electronic playthings. She, on the other hand, squeezed every penny until it was paper, and we did very well by it.

She'd frequently be annoyed when Dad wouldn't do farm work and other chores. But he just breezed through it in his easygoing way and rarely lost his temper. Over time, however, the nitpicking would wear at him until he'd had enough, so about once a year he'd blow sky high. That blowup would end the nitpicking for six months or so. They never seemed like a particularly romantic couple; their marriage felt more like a business arrangement. But then again, those six kids had to come from somewhere.



*My sisters, Carolyn (left) and Sally, sit on each side of me around 1934, sheltered by our father.*

Every summer, whether my father liked it or not, the family would leave Jackson and go to live with our grandparents and work on their farm. Using the stones that once littered his fields, Grandpa had built a farmhouse. Without electricity, they relied on kerosene lanterns. For fresh water, they dug their own well and also captured rainwater. Vegetables were stored in their hand-dug root cellar. They truly lived off the land. And on a winter's night when we were visiting, I had to think very hard—picturing the deep snowdrifts outside—about how badly I needed to visit the outhouse.

The grandkids' bedroom, summer and winter, was the attic. Our beds were tucked under the eaves, and the heat from the house furnace would rise up to us, cozy under piles of blankets. On stormy evenings we would drift asleep to the sound of rain on the metal roof, and awake in the mornings to the clatter of my grandmother lighting a fire in the wood-burning stove and, soon, the delicious aroma of baking bread.

Grandpa Fred grew corn, oats, hay, and wheat, but those crops were mostly to feed the animals. He earned a little money growing potatoes, beans, and cucumbers, but basically he took care of his cows, and the cows took care of him. Most of the cash came from selling cream to a local dairy. I would ride with him in his ancient Chevrolet coupe when he needed to take his produce to town, and he would shut off the engine to coast down the last hill into town to save gas. Finances were that tight.

He saved more money by fixing everything himself. Grandpa had his own little blacksmith's forge in a separate shed down by his barn. If he needed a new implement, or to replace steel rims on his horse-drawn mower, he'd crank up the fire and make it himself.

He used that mower to cut hay; all the work was done by animal power or by hand. As the horses pulled the mower, the wheels turned a gear and moved blades that cut the grass. I loved to help him, and frequently did it on my own. After we'd cut the grass, we'd hitch the horses to a large hay rake and pull the rake across the field again, time after time, shaping the hay into long parallel lines called windrows. Then it was time to go back down the lines with a pitchfork, making bigger piles. Finally, while the horses slowly pulled, we'd use the pitchforks to shovel the hay up into a wagon.

The backbreaking work wasn't done yet. Every time the wagon was full, the horses would amble

back to the barn. There, we'd use a large, spiked hay fork on a block-and-tackle pulley to lift clumps of hay up to the top. The worst job of the day was to be up in the top of the stifling hot barn, moving the hay to form a level pile. I often had that chore. We worked through the process time after time, until the field was cleared. Hard work, but cheap—the only cost was food and water for the horses, and for us.

At harvesttime in August, we would quit all other work and pick cherries at other farms for two or three weeks straight. As a kid, it took forever to fill the huge wooden boxes, called lugs, but we'd get ten cents for each one. We picked mostly sour cherries, used to make jam and pies, so we weren't tempted to eat too many of them. Most were picked by itinerant workers, who traveled from farm to farm, and they made us look like amateurs; they could pick ten times faster than we ever could. Still, ten cents a lug, it was money we needed.

When we weren't with my grandparents, we lived on our own tiny ten-acre farm along a steep dirt road at the top of a hill, just outside Jackson. The house was small, flat topped, and I suspect it was constructed as a garage for a home that was never built, then converted into a living space. We were half a mile from the nearest paved road. We had electricity and an oil-fired furnace to stay warm, but I don't remember a telephone. We drew much of our water from a well.

The countryside was dotted with hundreds of little lakes; I was never far from water. In the summertime, we could go boating and swimming. In the winter, there was ice-skating and ice fishing. The pastimes changed with the very distinct seasons. It could be miserably hot in the summertime and numbingly cold in the winter.

As a little kid, I had a lot of freedom. I'd walk down to the nearby railroad track and watch the steam trains go by. I'd look for deer in the woods. During the winter, the dirt road froze solid, and I'd love to slide down to the bottom or down another hillside into a frozen marsh. I did my own thing, followed my own interests, and didn't rely on others. I wasn't socially awkward. In fact, I was popular. Yet I never really needed anyone else. From an early age, I could look after myself, and I knew it.

I used to go off with the older kids on adventures, even when I was small. I remember a neighbor kid named Walter who was like a big brother to me, and on weekends in the winter we'd walk his muskrat trapline. He had a line of traps fifteen miles long, and yet we waded through deep snow to check them all, and earned a little money selling the hides.

Best of all, I would head alone for the rope swing hanging from a huge oak tree on the side of our hill. I could swing out fifty feet over the edge of that slope. The feeling of flying through the air, and the brief moment of weightlessness at the end, was exhilarating.

When I was eight years old, we moved into town for about three years before returning to the country again, where my parents found another farm less than a mile from where we had lived before. It was a much bigger, nicer house with two stories, five bedrooms, and a screened-in porch. The house needed some repairs, so we set to work remodeling. And my father finally had a basement, where he could hide away and tinker with his ham radio.

Everything in that house happened around the big dining table in the kitchen. I don't even remember going into the living room, which was the formal room for visiting guests. We were outdoors all day long, so when we came home it was to eat. Anytime I was at home, my mother was bustling around in the kitchen, and the house smelled of wonderful meals being prepared. When my sisters were old enough, they started helping her in the kitchen as well as watching over the younger kids and squeezing newly washed clothes through the rollers of a mangle.

Dinner was at six o'clock. With eight people to feed, my mother needed to keep a regular time. If

our farm chores weren't finished by suppertime, we went out again after eating and worked until they were done. Even my father, who worked unusual hours because of the movie theater, would be there whenever he could. He always worked holidays, because it was the theater's busiest time, but he made sure to spend time with his kids somewhere in the day.

Sometimes there were more than eight at the kitchen table. My parents didn't have many friends over—other than for their monthly Pedro card game—but there were always other kids around our farm. Our house was big, open, and friendly: everyone was welcome. It didn't make a difference who you were. If my friends were over, and it was mealtime, they joined in.

My mother was good at making food last. Many Sundays we'd kill a chicken and eat it for dinner, but that kind of meal was a luxury. Otherwise, we passed a large bowl around the table and ate whatever we were given. If we didn't like whatever it was, tough luck, we would go hungry. If it was the first time we'd ever seen a certain food, such as the fresh Canadian oysters my father loved, he'd gently insist that we give it a try at least once. If we were reluctant, his gentle tone became a little firmer.

After we cleaned up the kitchen, it was time to study, or go to bed. We didn't have a TV. We had a radio, but I was more interested in building my own crystal set radio than I ever was in listening to it. I loved to read, too, and devoured all the adventure books I could get my hands on.

During the day, I was at school, beginning in a one-room country school at the bottom of the hill, close to our farm. There was only one other student my age, Betty, but I didn't hang out with her much. I absorbed a lot of learning from the older kids. There were thirty-five students in that room, all different ages. The teacher was strict, quick to use a paddle and banish one of us to the corner. The parents were completely behind her; most of us earned another whack when word of misbehaving reached home.

America declared war on Japan when I was nine years old. I was in my father's movie theater when the news broke, and the mood was grim. Yet the conflict didn't seem to affect a remote place like Jackson much, at least for a young kid. My father was too old to serve, and all I recall is the gas rationing for our tractor. But Walter, my close friend who laid the muskrat traplines, did join the navy, along with others I knew, and served on a destroyer. Something happened to him in the war—I never knew what—but he returned from the war strangely quiet and withdrawn.

I grew up fast. From the age of twelve, in addition to attending school, I basically ran the farm myself. I was the oldest son, but it wasn't a family expectation. No one asked me to. I just did it.

We had ten acres, and I could easily have left it at that. Owned a couple of cows, let them graze, bought some hay for them in the winter—it would have been easy. But I imagined bigger things. I was assertive, and all the pieces soon fell into place. I grew the farm inventory until we had four cows, some goats, chickens, and ducks. I worked out a deal with the farmer next door to lease ten more acres, which I planted with corn. Then I negotiated a deal with another farmer up the hill who had an open twenty-acre field he was doing nothing with. I used the acreage to grow and cut hay, then bale it and bring it back to the farm. Goat milk was in demand back then. It is rich, doesn't trigger the same kind of allergies as cow's milk, and doctors recommended it to pregnant women. I didn't make much money selling it, but every dollar helped. We soon bought a tractor, which became my favorite ride, although I had to hand-crank the engine to get it started.

I loved all of our animals, but I didn't get attached to them. I learned at an early age that you can be as friendly as you like with animals, but you had to know that cute calf with big brown eyes would end up on your dinner plate some day. My grandfather, the softest soul I knew, adored his animals, but when it was time to butcher one, he did it himself. The only animal I grew close to was my farm dog,

Tippy. He was a mutt—mostly German shepherd, we guessed—and he followed me everywhere. The animals didn't mind him, and I did all the farm work with him padding along at my side.

I loved to work alone out in the fields. It was a great kind of freedom. Nobody bothered me, and my family was happy because I stayed busy. What else could they ask me to do? I was already doing it. I loved being by myself, plowing a field, planting corn, cutting and baling hay, and looking after the animals. I would focus completely on making an absolutely straight furrow when plowing, and the rest of the world shrank away.

Springtime was my favorite time of year, when the snow finally melted and the days grew warmer. I would make some sandwiches, head out into the forest, find a tree to sit under, and just enjoy feeling completely disconnected from everything and everyone. No one knew where I was or could bother me, and I was as isolated from other people as if I had been on the other side of the moon.

Despite the heat, I loved the summers. I would work on the farm all day, and nearly every night our family would pile into a car, head to a favorite lake, and swim. Those nighttime swims after a long, hot day of work were magical.

It was not unusual for me to work ten hours a day in the hot summer sun. One day I was carrying hay into a barn, and I passed out. I learned that if I didn't keep myself well hydrated my blood pressure fell dangerously low. From then on I always took a gallon jug of farmer's lemonade with me when I went out to the fields. It was a special kind with salt added, sold door to door by traveling sales folk. I never fainted again.

Farming occupied most of my time out of school, but I knew my mother expected me to aspire to more. She knew the life and she knew its limits. Unable to go to college herself, she created opportunities for her kids that she had lacked when growing up. First, she enrolled us all in tap-dancing classes, which I took for about a year. After that I began piano lessons. To pay for these extras, my mother had to take in neighbors' laundry, but it was worth it to her to broaden our horizons.

My piano lessons were hellish. My teacher was strict and would really crack the whip and push me, but I stuck with those lessons for almost a decade. I stayed with them because it helped me feel closer to my Grandpa Fred. He was musical and played the fiddle at monthly potluck dinners and dances at his local meeting hall. I learned how to square dance to the music he played and absorbed a huge amount of musical knowledge just being around him.

After a while, I could perform a range of classical music well and played at school functions. But I also performed in a local band, and our music was *very* different. In that part of Michigan, more than half the people were of Polish descent. The Polish-American club in town had their own hall, and every weekend they held a dance. In the tenth grade, a friend of mine who performed there in a polka band asked me to substitute for another piano player. I think I was the only member who wasn't Polish. Soon, our farmhouse walls were frequently shaken by the sound of our practicing group.

We played at these dances all the time and performed all night long. There were five of us in the band—all in high school, all good buddies—and over time we became pretty good. We wrote music, played on a radio station down in Toledo, Ohio, a couple of times, and even recorded a song, called *Chew Gum Polka*. We were once hired to go to Flint, Michigan, for a huge Polish wedding and played around the clock. Polish weddings were three-day affairs. We had a good time, and it put a little money in my pocket. At that time, I thought I might earn a living as a jazz pianist. If you'd have told me I'd soon be flying airplanes instead, I wouldn't have believed you.

My first memory of airplanes comes from when I was about four years old. One day, a twin-engine aircraft from a little nearby airport had an engine problem and made an emergency landing in the pasture below our house. It hit a fence and skidded to a stop in the grass right next to the railroad

track. They had a hell of a job hauling that airplane out of the field, and I remember running down to watch them in wonder. The experience made quite an impression on me. Yet I never thought about aircraft again until I was at West Point.

Similarly, although I ended up in a career that required engineering skill, I don't think my father's work as an electrician steered me in that direction. When I was a kid, I never understood the work he did.

I never spent time with my father while he repaired things in his little shop in town, but I did spend a lot of time with him when he ran the movie projection machine. "The Michigan," as it was called, was one of the most impressive theaters I have ever seen. It looked more like a Spanish church than a movie theater and was a wonderfully atmospheric place. Built in a baroque style, with ornate plasterwork, marble and walnut paneling, it had a hydraulic lift by the stage that elevated a guy playing the organ back in the days when movies had no sound.

When I was old enough, I had to go into town to the high school. The theater was nearby, so after school I'd walk there, head up to the projection booth, and sit with my Dad watching memorable movies like *Dracula* and *Frankenstein*. Of course, a few of my high school friends always wanted to sneak in and see the movies, too. When I flew to the moon, my father was still working in that same projection booth in that same theater.

I might not have been too interested in airplanes or electronics back then, but other mechanical things fascinated me, especially cars. My fourteenth birthday present was a driver's license. I could get a license young because I lived on a farm. Soon afterward, I bought a 1932 Plymouth four-door—a real junker for which I paid maybe thirty dollars. It had long, sloping fenders and suicide doors that opened on rear hinges—what we used to call a gangster car. It looked great, but it wouldn't run. It needed a generator, which I couldn't afford, so I found a dry cell battery, and ran the car on that. I'd leave the key in the ignition and disconnect the battery when I parked it. I tinkered with that car a lot and took serious mechanical questions to Laverne, a truck driver and family friend who owned a small auto shop up the road.

I drove that vehicle to high school until the day one of my buddies jumped on the back bumper, which promptly fell off. That was the end of that car, I decided. So I bought a 1932 Model B Ford pickup, with the first Flathead V8 engine that Ford built. I knew I had to rebuild the engine, so I went to Laverne's auto shop. He'd watched my interest in cars develop over the years and was delighted to assist me. Using his chain hoist, we pulled the engine out of that car and rebuilt it.

Rebuilding is a fairly precise task if you want to do it right, I learned, but I managed. I drove that car for a couple of years despite its many quirks. The steering wheel was temperamental: every time I'd turn right the lights would come on. No problem—turning left switched them off. The brakes were also tough to adjust, and the only one that worked well was the brake for the right front wheel. I didn't care. I loved machines, broken brakes and all.

After school I used to take that Ford truck, load the back up with friends, and head to a local lake where a lot of my friends spent the summers. Like many high school kids, we acted crazy, and never thought about safety. We'd drive over railroad tracks, kids would bounce up and down in the back. I was really lucky that nobody ever got hurt. Eventually I sold the truck because I could finally afford a 1937 Ford Roadster, which I drove in my senior year. It truly was a gorgeous car: a two-seater with a rumble seat, a convertible top, and another engine that I rebuilt. Right after I graduated, however, it all came to an end.

Naturally, it happened at the worst possible time: a camping trip with two good school buddies named Don and Hugh. By then, that car looked really slick. It had black paint with white sidewall tires, a white top, and white running boards—just perfect. We drove it to the Upper Peninsula of Michigan, where we camped out for a week. On the way back, while I slept in the rumble seat, Hugh noticed that the engine started to make a pinging noise. He didn't know what it was, so he pushed the gas a little, made it go a little faster, and the pinging stopped. Eventually, however, the sound came back again. So he went faster and faster to make the noise disappear, until he was tearing downhill at about seventy miles an hour. At the bottom of the hill, the engine froze. That jolt woke me up in a hurry, and we found we couldn't start the car again. It turned out that there was a leak in the oil pan gasket, and there was no oil left. Without any lubricant, the engine seized up. So that mishap was the end of that car; I had little choice but to just leave it there. I don't remember how we got home, but I do recall the pain of losing that beautiful machine.

Even when a car broke my heart like that, I still loved it. You can take the engine out of a car, tear it all apart, rebuild it, and put it back. Then you hit the starter and, like a miracle, the engine you rebuilt kicks over and rumbles to life. It feels so fantastic that mechanical things, and fast cars, have fascinated me ever since. If you are ever on a coastal road in eastern Florida and see a guy in a Tommy Bahamas shirt driving a convertible sports car and zooming by you—strictly obeying the speed limit, of course—there's a fair chance it could be me.

Back in the forties, I didn't give myself much time for other high school pursuits, such as drinking and dating. We all smoked, but I didn't have my first taste of alcohol until after high school graduation. I did spend time running around in cars with my friends, and often girls came along. When I was president of the student council, I dated the vice president for a while, but we never got hot and heavy. I never wanted to push myself on anyone. Although I thought about girls a lot, I never took it further. In truth, with the farm to run, playing in the band, and fixing my car, I was too busy to date.

Farming was a good life, but it was hard work, and I had to get my school friends to help me when it was time to cut the hay. If I could have earned a lot of money as a farmer, I would have done it. But as I grew older, I realized farming would never get me anywhere. As much as I enjoyed it—and I *loved* it—there was just no money in farming. It couldn't be my future. My world would be bigger than the farm.

I also knew early on that I wouldn't get caught in that little bitty town for the rest of my life. Jackson had always been an automotive supply town: some plants made upholstery, some made tires—all kinds of car parts that nearby Detroit needed. While I was in high school, the companies started to have problems with the labor unions. When they couldn't come to an agreement, many of the manufacturers simply moved out of the state, to places in the South that had no union issues. It was sad. I watched Jackson become a ghost town. I returned for a visit in the late 1960s and it seemed like all the stores downtown were shuttered. They tried for years to revitalize the place, but nothing worked because there just weren't many businesses left.

Most of my classmates planned to work for the auto companies, and they had a tough time ahead of them. The group that I ran with in school was a little different. Their parents were managers and owners, doctors, and lawyers. They were expected to go on to college. I knew I had to do the same. My parents were supportive but, of course, they had no money.

A scholarship was my only option, and luckily I did well in high school. President of the student body in my senior year, I also received some awards when I graduated. Perhaps most importantly, the principal, Earl Holman, watched over me like a second father and guardian angel. He pushed me both academically and personally.



Holman really pushed hard for me to get into college. To my delight he found me a full scholarship to Princeton to study philosophy and politics. The scholarship was a huge amount of money in the 1950s. Overjoyed, I eagerly made plans to attend. Then, two months later, came a devastating blow. Holman called me into his office and told me the university had reviewed my records once again and noticed that I had not taken any Latin in high school. Apparently that little detail was enough for them to pull the scholarship. I felt hugely let down and deeply concerned that my plans to leave town were over before they had even begun. Perhaps I was destined to work on a farm for the rest of my life.



## CHAPTER 2 SOLDIER

I should have known better. Earl Holman did not give up on me. He scrambled around until he found me a scholarship that paid my tuition for the liberal arts school at the University of Michigan in Ann Arbor. The college, only thirty miles from home, was an affordable first step. I started the courses there with excitement and hitchhiked home every weekend to wash my clothes.

The university was a wonderful place and convinced me more than ever that the last place I wanted to go back to was that farm. I would have done anything at that time to stay away from it. I could happily have stayed at that university taking general classes, and then moved into the music school there. The scholarship was only for a year, however, and time would run out soon. I needed a plan.

A sports scholarship was out of the question for me. I'd wanted to play football in high school, but I had been examined by a doctor and told that I shouldn't play, because I had a rheumatic heart. That diagnosis deeply puzzled me because my heart could only have been rheumatic if I'd had rheumatic fever, and I didn't recall that ever happening. I have always suspected that my mother put the doctor up to that diagnosis because she didn't want me to get hurt playing sports. She steered me into music instead. I guess I will never know the truth for sure. Certainly no other doctor, including the meticulous doctors at NASA who prodded and probed me more than I ever wanted, ever found anything wrong with my heart.

While I studied at college, I found another possible future direction when a high school friend of mine introduced me to his father. He told me about his other son, who had entered the Coast Guard Academy, and then he really began to put pressure on me to apply to one of the military academies. He had never been in the military himself, and he didn't really care which service I went into. He just strongly believed that attending a military academy would allow me to go to college at no cost to my parents. My father hadn't been in the military—no one in my immediate family had—and it wasn't something I'd particularly considered before. But I knew my family's finances—or lack of them—and it began to look like my only option.

My initial thought was, hey, I'll take a shot at this, but I will probably never get in, because there are so many other people out there who are so much smarter than I am. I did not think about what would happen next: that I would have to spend a couple of years serving in the military. I only knew that the academies had great reputations, and that I would get a free education, as well as a way out of Jackson.

I talked it over with my father, and he agreed that it sounded like something to pursue. So we went to meet with my local congressman, Chuck Chamberlain. The only way I would be able to get in was for my state's political representatives to personally recommend me. Chamberlain, therefore, arranged for me to take a competitive examination. The results were sent to him, as well as to the two

senators for my state. To my delight, I received an appointment from one senator to attend Annapolis, the Naval Academy, and from the other to enter West Point, the academy for army cadets.

I never learned how I did on that exam, but I guess I must have done pretty well, and the recommendations from my principal certainly helped. So I found myself in the fortunate position of having a choice. I did a lot of research on both academies, and for some reason I just never felt like I was a navy kind of person. I can't explain why; it's like some people prefer one kind of car to another. The more I researched West Point, and the history of the people who graduated from there, the more it sounded phenomenal to me, and I really fell in love with the idea of going there. I didn't know that since one-third of the students from each academy would eventually end up in the air force, it would have made no difference to my future which one I attended.

It was quite a change for me to go from thinking about the music world to an entirely different life in the military. I am ashamed to say that, once I knew I was going to attend West Point, I really let my work slide for the rest of that year at Michigan. I got through okay, but not well; I had lost interest, because I knew I was leaving.

I was also depressed. My grandfather had always felt pain in his injured ankle, especially in winter. Now, his doctor found that the old break had also created a blood clot. They had to amputate one leg, and then the other. With no legs, that tough and active farmer lost the will to live. He died while I was at college, and I felt I had lost my best friend. There was now even less reason for me to stay in Michigan.

I had to report to West Point in early July of 1951. I took a plane, my very first flight, in fact, to get there. I would spend the night in New York City before taking a train to the academy.

I had never been to a big city like New York before; I was unsure how to act. But I was hungry, and that gave me courage. After strolling around town and spying some nice-looking restaurants, I walked into one and asked the maître d' for a table. They required a jacket and tie, he said, and I wasn't wearing either. I was heading for the door, when to my relief, he told me he would see what he could do. Emerging with a tie and jacket from a nearby closet, he told me I could stay. It was a strange introduction to a much wider world.

I was about to join an even stranger world: the United States Military Academy at West Point, fifty miles north of New York City, overlooking the Hudson River. It is not only one of the biggest school campuses in the world, but also has been an academy since 1802. The day I showed up with more than eight hundred other new students, our lives all changed.

My first view of West Point left me awestruck. We traveled alongside the Hudson by train, then disembarked by the river. After being assembled into groups, we were marched up the steep hill to the academy. I was completely blown away by the sight: the lofty gray stone buildings, set against a green forest and the blue river below, seemed like something out of the Middle Ages. Inside, the main hall looked like a vast European cathedral. It could seat two and a half thousand hungry students at once, while long-dead venerable generals who once studied there, too, looked down sternly at us from oil paintings. Naturally, I was intimidated by the scale and dignity of the place. Would I survive at this strict institution? I wasn't sure.

Then we were thrown into the furnace. Older students appeared all around us, screaming a rain of commands, most of which I couldn't understand. We were lined up in a hallway and ordered to memorize a response to a command. It should have been simple, but with students right in our faces, nose to nose, shouting at us, it was hard to remember even the simplest phrase. It was terrifying. I was only allowed to look directly ahead, but could hear piercing shouts, commands, and marching all around me. I had no idea what the hell was going on. I had to suck in my gut and mentally steel myself.

“I’m going to survive this,” I repeated silently to myself, “I’m going to survive.”

Ordered to the barbers by a hail of screamed commands, we all had a haircut, thirty seconds per student, and at the end we had almost no hair left. Then we put on our unfamiliar new uniforms. We packed our civilian clothes away: we wouldn’t see them again for a year, and by then they wouldn’t fit us anymore. We’d lose a lot of weight and put on a lot of muscle.

Right away, the older students taught us marching drill. From day one, they owned us. They drilled the hell out of us until we were lightning fast at responding to orders. By the second day, we marched everywhere in formation. They even lined us up to head to the showers and gave us one minute to get clean and get out. Everything we did had an overriding sense of urgency, discipline, and precision. They only left us alone when we slept.

I had spent a year in college already. No one cared. Another student had already graduated from another college, and it didn’t matter in the least. We all started from scratch and took the same courses. You can’t lead until you learn how to follow: that was the West Point philosophy. I quickly learned how to follow.

The senior students pushed us hard from the time the Drum and Bugle Corps of the West Point band woke us up at 6:00 a.m. until we collapsed into bed at the end of the day at 10:00 p.m. When that band started playing in the morning, it was loud enough to wake the dead, and was followed by the clatter of boots on stairways as everyone rushed downstairs to get into formation. Orders were shouted, bells rang, and in response hundreds of students moved instantaneously in tight precision, as if they were one person.

Marching in formation, eyes straight ahead, chin tucked in, commands yelled at us from all sides, we’d head to the mess hall. When we heard the shouted command of “Taaaaaake SEATS!” we sat in unison. We ate sitting at rigid attention, our eyes locked on our plates as orders and questions were barked at us. If our answers were not satisfactory, we would be ordered to stop eating and recite academy regulations until our inquisitors were appeased. Away from the mess hall, minor infractions led to twenty pushups or some similar torture. I particularly dreaded the command to lie on a four-inch-wide horizontal bar high off the ground and make swimming motions with my arms and legs until they burned with pain.

Our uniforms and shoes had to be immaculate. Anything less than a perfect fold of cloth or a perfect shine of brass and leather and we were pounced on and punished. If our hair was a fraction too long, or even if we had a smidge of dirt under our fingernails, we were in trouble. Our rifles had to be perfect, too, and we learned how to take them apart, clean and reassemble them before practicing elaborate drills.



*In my uniform at West Point*

For the first month, a football player shared our barracks. This huge, tough guy was so intimidated by the constant commands that he couldn't summon the courage to leave the room at night to use the bathroom. The moment he stepped out of the door, even in the middle of the night, he knew some older student might pounce on him with a new set of commands. Instead, frightened and humiliated, he'd pee in the sink.

That first year was pure hell, and I felt I would never last. Sizing up some of the other new cadets, known as plebes, I thought: I am dead. They're the cream of the crop. I'm just a Michigan farm boy, and I'll never be able to compete with them. I was as concerned about my peers as I was about the older students. So I decided to keep my head down, stay out of trouble, and make sure I did everything I was supposed to do, exactly the way it was supposed to be done, without cutting corners. I shined my shoes every day, went to formation early, and always stood up straight with my chin in. Thankfully, after I had been there for a few months, I settled into a routine, and nobody bothered me. I was rarely called on the carpet. A lot of my fellow plebes had trouble figuring this out, and many of them left. To be honest, I even came to like the routine. If you really got with the program, became part of the system, and did what you were supposed to do, life became tolerable, as you did pretty much the same thing every day.

The older students really whipped us into shape—if we could stand the pace. Many of the plebes couldn't stand the pressure. Nearly half of my classmates dropped out before graduation. Some probably didn't make it through the first day. For those of us who could handle the mental anguish, however, it changed our lives. If we did something wrong, the punishment was so harsh we would never do it again. The system made soldiers out of those who could handle discipline and were willing to work at it.

We did a lot of physical training, because many of us were out of shape when we arrived. To gain entrance to West Point we only needed to pass a physical, not be amazing athletes. During my physical they confirmed that my heart was fine, which made me suspect that my mother had been playing some games with me earlier.

Athletics was a required course, so most of us ended up in good shape. I started out on the cross-

country team, and then switched to gymnastics for about a year and a half. I sweated in the gym every afternoon, but I was never that good. I worked hard at it and even lifted weights, yet I just didn't have the right physical build. So they pulled me onto the cheerleading squad, which was considered pretty much a sport. I was head cheerleader for two years. I don't know how many people can put both astronaut and cheerleader on their résumé, but I can.

Morale building is a cheerleader's job. Embarrassing the navy team before big football games was, therefore, a primary objective. In 1953 we snuck onto the Naval Academy grounds and stole their beloved mascot, Bill the goat, from his living quarters behind the stadium. We led him into the back of a convertible and almost made a clean getaway, until we stopped to get some gas. While we were filling up, the disgruntled goat stuck his horns clear through the convertible's canvas top. We got away, but our cover was blown.

We hid Bill in the countryside, but word got back to the Naval Academy that West Point cadets were to blame. Soon, the phone lines were buzzing between officials from both academies, and I hear that even President Eisenhower got involved. Bill was to be located and returned. We only complied when our commanding officer directly ordered us. Privately, despite all the ruckus we had caused, I think he was a little proud of us.

On another occasion, we disguised one of our trucks before the game, painting it with navy colors. We planned to drive it in front of the navy grandstand then lead our West Point mascot, Hannibal the mule, out the back instead of the goat they would be expecting. It rained the night before, however, and the stunt came undone when the truck became stuck in the mud. Then, to make matters worse, we also lost the football game.

Academically, West Point had a very fixed curriculum. The only class we could choose, as I recall, was a foreign language, which allowed me to stumble through French for a few years. Everything else was a canned program, because we all worked toward the same bachelor's degree in military science. We took mathematics, engineering, chemistry, and other basic courses, but did not learn as much as students in other elite colleges. I had to make up for this deficit later on. Instead, we focused intently on military history and military topography. Of course, I had no time to practice the piano, so I gave it up for many years.

My world shrank to within the walls of West Point. For the whole first year, we were not allowed to leave campus or go home. My parents scraped together the money to visit me at Christmas, driving the whole way and sleeping in a trailer. But even then, I could not leave the campus. The rules eased up a little in my second year; I could go home for Christmas and take a month's leave in the summer. I also looked for rewarding diversions. In my second year I joined the cadet glee club. I had previously auditioned for the chapel choir, but the choirmaster had told me to confine my singing to the showers. At least, with the glee club, I could sing baritone in the background while someone with a better voice sang the lead.

The glee club exemplified the great sense of camaraderie we felt at West Point. On one occasion we were asked to sing in New Orleans for a holiday celebration, and we were all set to stay in a downtown hotel. Then the hotel manager found out we had a couple of black cadets in our group, including our lead singer. Could they stay in another hotel, he asked. Hell, no! They were West Point cadets and therefore our brothers. We canceled the appearance. For all of our old tradition, West Point was ahead of 1950s America in many areas.

The parades we held on Saturday mornings were so well performed that they brought tears to my eyes. The companies were organized by height, so when we marched down a street all of our hats were absolutely uniform; we could have laid a board across them. I was right in the middle of the

height range, so I marched in the center of the parade. Passing down the streets of New York City with our academy band playing, which we did on special occasions, was a phenomenal experience. Our white pants were immaculate; they were so stiff with starch that the legs were stuck together. We had to break them apart with a bayonet so that we never messed up the crease. Then, to put them on without wrinkling, we hung from a bar while someone else pulled our pants up. We wore plumed hats, cross belts and sabers, like uniforms out of the Revolutionary War. We polished our shoes and brass until they shone like jewels. When you have two and a half thousand cadets all marching together in impeccable uniforms, it is truly an amazing sight. We wanted to make sure that the public who watched our parades would remember the event for the rest of their lives.

The West Point honor code was equally impressive to me. We could not lie, cheat, steal, nor tolerate those who did. The reasoning behind the code was, when in battle and under great pressure, you had to be truthful so that your commander knew exactly what was going on. A lie could result in a defeat or the loss of many lives.

We didn't dare do anything that violated our honor. It applied not only if we were caught cheating ourselves, but also if we knew that someone else cheated and we didn't say anything. With integrity came trust. At night, as we went to sleep, the older students would come around, knock on every door, and say, "Alright, sir?" We would reply with the same phrase, confirming that we were in bed with the lights out. They wouldn't come in to check: we were trusted. Liars, however, were in big trouble. The rules were simple and unforgiving.

I saw a graphic example of the academy's discipline right after I arrived. I remember marching through the main part of the campus and noticing a whole bunch of guys standing along a porch in one of the residential buildings. They were dressed partly in uniforms and partly in civilian clothing, lounging around and not doing much of anything. At a highly regimented place like West Point, they looked extremely out of place. I soon found out they were waiting to leave; they were being expelled for violating the honor code. I was joining West Point right after a huge scandal had broken. More than eighty students were kicked out for cheating on academic tests. Most were connected to the academy's football team, including the coach's own son.

I remember being very impressed that these cadets, even though they were great football players and very valuable to the school for their playing skills, were forced to leave. There were no gray areas: you just could *not* cheat. In my opinion, it was a great code to live by. I thought about it a lot, a couple of decades later, when I was kicked out of the astronaut office and accused of breaking some unwritten honor and professional judgment codes within NASA.

On the other end of the honor scale, I learned, was the West Point graduating class of 1950. I started at West Point in the middle of the Korean War, and most of those young men had been sent to Korea a few short weeks after graduation. They were sent into combat with no time for the training that may have saved many of them, because the conflict escalated surprisingly fast. As a consequence, a high percentage of those students died in the war. I learned of two different tragedies: the honorable dead and wounded and the cheaters from the class that followed. It was a lot for a young kid like me to think about. I didn't want to share the fate of either, but given the choice I think I would have chosen the honorable death.

After my first year, we were allowed to venture into New York City alone for a couple of weekends each semester. My love of cars had not faded, so when the restrictions eased in my senior year I bought a new car with borrowed and saved money. We cadets received a monthly allowance, and while some was spent on uniforms and snack food, I scraped together enough to buy a 1955 convertible Chevy. I'd take that car out on the weekends whenever I could. The only thing my parents

had to pay for while I was at West Point was my first set of uniforms, which cost them around \$300. Other than that expense, they were off the hook.

By my last year at West Point, life was pretty good. In fact, we lived like kings. We outranked everybody and probably got to be a little bit snobbish. We had started as the lowest of the low in our first year, then worked our way up through the ranks, and got to feeling pretty cocky about it—almost as if we were better than the majors and captains on the staff. Of course, when we left West Point, we found out very quickly that wasn't the case. But in the meantime, for one golden glorious year as seniors, we enjoyed life at the top of the heap. I ended up militarily ranked number six in my class and made battalion commander, which meant I had three companies under me. I had many privileges and could pretty much come and go as I pleased, as long as my three companies were behaving. Officers who had formerly commanded me acted more like advisors now, and my life loosened up a great deal.



*At home for Christmas, still half in uniform, with my brothers and father*

I know I was considered for even higher positions because they made me the commander of a joint operation with the Naval Academy, even before my senior year. Yet my early resolve to keep my head down and stay out of trouble may have backfired on me. I didn't make an impression on the key people. I did what I needed to do and tried to be helpful to guys who needed academic help. For example, I took one student who was failing in math under my wing, spent a lot of time with him, and he finally graduated. I guess that was more my way to do things: staying low-key and out of serious trouble.

Even though socializing wasn't on the agenda much, fortunately my life was not too monastic—which in my late teens and early twenties would have been a cruel torture. There were no women cadets at West Point then, so other than a few secretaries and nurses we never saw females around. But the academy sponsored a dance every Saturday night, and girls would come in from Vassar and



the other nearby schools. Rather than “dating” them, this was a formal event organized by the colleges. The moment the dance ended, our female guests disappeared on a bus, never to be glimpsed again. We never made any real personal connection with any of them. They were generally much richer than we were, and since they were from exclusive girls’ colleges, I always felt that they disdained us a little. Some of them could be cruel. I vividly remember a cadet who had an unusual name introduced to one of these girls. When she heard his name, she laughed so hard and so long that eventually he had to just walk away.

If I hadn’t been caught doing something inappropriate with a girl, I might have been given the prestigious job of commanding a regiment. It sounds quite shocking to write about the incident that way, so I had better explain. The story will give you an idea of how strict life was at West Point. During advanced infantry training in our second year, we were allowed free time on Saturday afternoon and on Sundays, so I invited a girl up to see me. We had dated a couple of times, but we weren’t serious; I am embarrassed to say I can’t even remember her name. We rowed a boat across a lake and joined a large group of people on the other side. At some point, I took her hand to help her along the shoreline where the footing was tricky. A tactical officer was sitting across the lake with a pair of binoculars, watching everybody, and spotted us holding hands. Horror of horrors! Such familiarity was a violation of academy rules, because it constituted a “public display of affection.” They did not fool around when it came to infractions of the rules. My punishment was eight hours of what they called “walking the area”—marching nonstop outside in full uniform, rifle on shoulder, whatever the weather. I would eventually hold hands again with a girl in public, but not for the rest of my time at West Point.

One student, a year ahead of me, was a star. His name was Dave Scott and he was a regimental commander. The perfect cadet, he was at the very top in his class, with great grades and the commanding presence of a born military leader. I don’t remember meeting him in those years, since different regiments did not socialize much, but I heard about him. We would meet again, a decade later, at NASA.

Despite the charms of guys like Dave Scott, I knew of one New York girl who had eyes only for me. It began, like many romances, on a blind date. I had a roommate at West Point from Astoria, Long Island, named Dick. He and I were really great buddies, and when we headed to New York I would stay at his house. One time Dick had a date with a girl, and a friend of hers tagged along, so they invited me to make up the numbers. The friend was a very cute, soft-spoken girl named Pamela Vander Beek. She was tall and slender, with entrancing brown eyes and beautifully long auburn hair that curled just a little at the end. I found her very easy to be around. She had a down-to-earth approach to life, with no pretensions, and we hit it off right from the start. We dated during my last two years at West Point.

I found Pam’s family fascinating. They were one of the older Dutch families in New York, and many of the city’s institutions were run by the Dutch in those days. Her father worked at the old Hotel Astor, a historic hotel right on Times Square. All of the management staff at the hotel was Dutch. The Vander Beeks had, in the past, enjoyed wealth beyond a Michigan farm boy’s comprehension. Pam’s father had traveled to school every day in a chauffeur-driven Mercedes and married her mother back in the twenties. They were on their honeymoon in Europe when the stock market crashed and wiped out their wealth in one stroke. They managed the return trip to the States only because they had round-trip tickets. Having grown up in luxury, Pam’s father then had to go to work as a playground director for the city parks system, the only job he could find. However, the Dutch community all helped each other back then, and he ended up finding better work at the Hotel Astor as the purchasing agent, which

was a very important job at the time.

Pam, therefore, grew up with little money, but in a smart, sophisticated family used to great affluence. When I first met her, she worked in New York for a greeting card company and shared an apartment with a couple of other girls. On weekends we would get together in the city, or she'd ride a bus up to West Point to join me for a football game, to tour the school museum, or just take long walks. Of course, I would also take her to the Saturday night dance, where the army band would play old, slow songs like "Aura Lee" for us to dance to.

Whenever I could get a weekend off in the summer, Pam and her parents would pick me up and we would go to the family's private lake, up in the mountains near Binghamton. A lakeside cottage was one of the few things left from the family's days of wealth. It was a great getaway where we could swim, boat, and rest on the shore without anyone else around who had not been specifically invited. A big crowd of people usually descended on weekends, and the Dutch chef from the hotel would come up and prepare dinners.

It was like nothing I had ever experienced in my farming background, and a lot of fun after a strenuous week at West Point. I soon grew very close to Pam's mother and father. They became like second parents to me and even loaned me money to help buy my car during my senior year.

Pam and I married at the cadet chapel on the hill overlooking the West Point campus in 1955, just before I left the academy. Naturally, we had our reception at the Hotel Astor. I truly felt like I belonged as a member of Pam's family, and that we had the same aspirations and dreams for the future. In retrospect, neither of us knew—or perhaps could have known—what a tough road it would be for us both. I dragged a kind, loving, and gentle girl into some hard places, where it was impossible for her to follow. Could we have known that was coming as we celebrated our wedding day? Probably not.

Pam was my first serious girlfriend, and now she was my wife. The day I married, I was still a virgin. It wasn't that I'd lacked the opportunities in high school. It just meant something special to me, so despite all my raging teenage hormones, I had waited. However, my patience meant I knew little about love and marriage.

In retrospect, I was too young, too focused, and too ambitious to be a great husband back then. My ambitions, and the military life, simply would not allow a young love to grow and flourish. We were two naïve kids, headed for brutal military lives in distant outposts. I had no real business bringing this trusting girl along. But I didn't know. We were in love and believed we could tough it out.

In those first months, we couldn't have been happier. Yet with my time at West Point ending, I'd also had to make some decisions about which branch of the service I wanted to join. The free education came with a price, and it was time to pay the military back for the years they had invested in me. Pam and I steeled ourselves for the unexpected. Military life was new to both of us: we had no personal experience or military family members to learn from. But I was ambitious and ready to dive in.

During my first few years at West Point, I felt I would want to remain with the army. My idea of a glorious military career was to be the first guy charging up the hill in a battle, with all the troops behind me. In my final year, however, I began to change my mind. A couple of my tactical officers were from the air force, and they really started working on me, explaining how it was the place for a more technically minded guy like me. In the new jet era, the air force seemed like a glamorous service branch, too, and that also formed part of my decision. To be honest, however, I still wasn't sure I would enjoy flying.

In the end I chose the air force because I thought I would get promoted faster than in the army.

That's what those tactical officers told me. It turned out to be totally false—complete sales talk. But damn them, it worked. It wasn't the last time I would run across those guys either. One of them, an officer named Jim Allen, would offer me some great advice a couple of years later, when I felt like quitting the military altogether.

We all gathered to choose our service specialty in a process called branch drawing. Not everybody got his first choice. Instead, we lined up in a big theater in order of academic standing. Starting with the top guy, we chose different branches of the army or air force. Because they did not have their own academy graduates yet, one-third of the graduates went to the air force. Army engineering went fast, as the bright guys took those places. Once the number of slots for each branch was filled, they were crossed off the board. By the end of the process, the last guys had nothing to choose from.

That day, the process was overseen by the superintendent of the academy, a formidable army general named Blackshear Bryan. He was a real blood-and-guts soldier, not long back from the Korean War, and bald as a billiard ball. As far as he was concerned, the infantry was the Queen of Battle and, by God, that was the way it would always be. He did not want anything to do with the air force, and forced air force officers stationed at West Point into out-of-the-way offices.

Perhaps it was a reflection of changing times, but that day the air force slots were chosen as fast as the army engineering slots, until about one hundred and fifty graduates remained—the bottom guys—who had no choice but to stay in the army and serve in the infantry. Feeling sorry for the general but also a little amused, I watched him as the selections were made. As, one by one, we chose the air force, I watched a flush of red rise up the back of his neck and spread across the top of his head, until he looked like he was going to explode. Before the selection process ended, he jumped to his feet and stormed out of the theater, completely disgusted. The times were changing, and he hated it.

In just a few years, I had come a long way from the farm. I had married, joined the air force, and was about to begin a flying career. I hoped like hell that I would be able to learn how to fly aircraft, enjoy the experience, and survive. I had made a big career decision with little to base it on. My total time piloting an airplane at that moment? Zero. For all I knew, I was going to be the worst pilot the air force had ever attempted to train.



## CHAPTER 3 AVIATOR

The air force first sent me clear down to the border with Mexico, in south Texas. I was assigned to Moore Air Base, a private field just west of the town of Edinburg. On a warm and clear June morning, Pam and I loaded up our new Chevrolet convertible, put the top down, and headed south from her parents' home on Long Island.

Pam and I had married so that we could be together during my training. We had already decided to spend our lives together, and we didn't want that commitment interrupted. Why wait, we reasoned? We'd been dating long enough that marriage seemed like a natural step.

America was at peace when I joined the air force. The Korean War had ended in 1953 while I was still at West Point, two years before I graduated. It was clear, however, that America could be pulled into a conflict with another country at any time: the era of the Cold War always felt tense.

The base wasn't where I wanted to be assigned. When we left West Point, we were allowed to suggest three choices of training bases. I chose locations in Florida and Arizona and didn't even consider Moore, but they assigned me there anyway. Once in Texas, we found a tiny apartment in hot, dusty Edinburg. For the next six months I traveled thirty miles to the base every morning as part of a carpool of pilots, so Pam could have the car during the day. We couldn't live any closer; the air base was pretty isolated.

But there wasn't much for Pam to do in Edinburg even with a car; it was not our idea of a great place to live. It was a typical little Texas town with a small square, a movie theater, and not much else. The nearest interesting place was Monterrey, but that city was located deep into Mexico, and it was hard for Pam and me to escape there other than for an occasional weekend. More often, we'd just drive a few miles south of home to the Mexican border town of Reynosa for some of the best steaks I have ever had in my life. The only other "entertainment" in that border town wasn't the kind a newly married man should be involved in, so I steered clear of that.

It was a very different life for both of us, which left little time to get to know each other better. But during my training, in the hurried moments I had to reflect on it, I believed that Pam was adjusting to military living just fine. We tried to make time at the end of every day to have dinner and talk for a while, see a movie, or maybe visit some friends. She quickly made new friends in town and kept busy with them, especially a group of women she would invite over to play bridge. One day I came home to find all of them standing on chairs in the living room, and Pam had a broom in her hand. A rodent had snuck into the house and thrown their quiet afternoon into disarray. I had to catch it and throw it out. A mouse was one of the less dangerous creatures that ran around in that desert region. Every morning, as I drank a cup of coffee in my kitchen, I was guaranteed to see a scorpion walk across our doorstep. They never came in so we left them alone, but we checked our shoes before putting them on,

just in case.

I started a new round of ground school and flight training classes with civilian piloting instructors who prepared me for my first flights. If I thought they would take it easy on us beginners, I was wrong.

When we showed up in the morning, three of us would sit with one instructor so we could discuss the training for that day. I was assigned to one of the most fearsome guys I ever met. His call sign was “Bendix,” after the brand of washing machines, because he was a scary, tough guy with a reputation for washing out students. He looked like an old crop duster, wrinkled by the sun, leathery, and tough.

Bendix learned to fly the hard way, cleaning airplanes as a kid in Mississippi in exchange for flying lessons. His philosophy was, if it had been tough for him, by God, it would be tough for us, too. He seemed to have no desire to help us learn and pass the course, only to constantly test us. Of the three guys originally assigned to his table, I was the only one who made it through the training.

Bendix took me up on my first flight, and all through it he yelled and screamed at me. He did it on my next flight, too; I realized that this was his teaching style. In fact, to call it “yelling” is an understatement. We were flying T-34s, which are little propeller airplanes ideal for students, and when they were all lined up at an airfield, engines running, they would make quite a noise. Bendix was louder. You could still hear him screaming at some poor student. He scared the crap out of us. It was like my first year at West Point all over again. I began to wonder, was this something I could really do?

Everything Bendix did was for real. He didn’t fool around. I frequently came home exhausted from the ordeal and told Pam that this was not what I thought the air force was going to be. She was a patient listener and helped me through some stressful weeks. Luckily, there were also days when I could tell her I thought I would be okay. Yet it was always tough. Bendix did things in the air that frightened the hell out of me, like suddenly throttling the engine to idle and then telling me to land the airplane without power. I’d quickly search for a field that looked survivable and head on down. One time, I was coming in low without power when at the last moment we both noticed a herd of cows directly in our path. He quickly throttled up the engine, and we must have roared over those startled cows with no more than ten feet to spare. Bendix forced me, however, to think through all his yelling and screaming, and to concentrate on the airplane and my flying. I had to mentally set his voice off to one side and listen to what he had to say without being rattled by it.

I have never been a stick-and-rudder type of pilot who flies by the seat of his pants. Instead, I began to feel a growing love for the precision of flying. I liked the sense of freedom it gave me, combined with the discipline and knowledge that I needed to do it right. Despite all the yelling from my instructor, flying began to feel comfortable. It was as if the airplane had become a part of me. As I grew to understand how it all worked, I became increasingly in tune with the mechanical systems. I realized, with pleasure, that I had a knack for it. Once I could fly solo, I enjoyed it even more because I didn’t have to listen to that damn yelling on every flight.

I was hooked. I loved walking out on the flight line in the morning and hearing the engines starting up. The T-34 was one of the prettiest airplanes I had ever seen, and as it started up it would make a buzzing noise like a sports car. Elsewhere on the field, other pilots would be starting the engines of their T-28s, a heavier, faster airplane with a big radial engine. They had a deep, throaty roar to them; the sounds of the two engines would merge into an all-permeating, gut-shaking rumble. It was an enticing call to strap in and go; the airplanes were urging me to take them up there.

The other students at my table disappeared one by one as they asked to be assigned to other instructors or they washed out. But I just kept going, and Bendix kept on yelling. This lasted until the

final part of the training, when we began instrument training. Then he became a totally different person. To teach me how to fly using only the airplane's instruments, he placed a canvas hood over the front of the cockpit so I couldn't see out. Then, seated behind me, Bendix very calmly and coolly told me what to do.

Since he wasn't shouting, I really paid close attention and did everything I was supposed to do. It turned out that instrument flying was the easiest part of the training for me. I really took to it, finally feeling that I could be a good pilot after all. I will always believe that Bendix was the reason I mastered instrument flying, which allowed me to gain the experience needed to become an astronaut. Although most days I hated the guy, I will always be grateful to him. He knew how to make pilots out of students who were willing to try hard and not buckle under his wrath.

After six months of primary training, Pam and I were growing used to life in Edinburg. She'd made a tough adjustment to follow me, but we were doing okay. Of course, as soon as we had settled in, we had to leave. Where we would be assigned next depended on my chosen preferences and how well I had done in the class. Some of my fellow students would go on to train as pilots for multi-engine airplanes. I had done well enough to go on to a more coveted assignment: single-seat jet training.

On graduation day, we celebrated at a local hall. We did not invite wives or girlfriends to this party, and as the drinks flowed, the night took on the feel of a bachelor party. Before long, we had a phone call from a classmate who had driven over to Mexico and hired a "dancer" for the celebrations. The border officials stopped him on the way back, insisting that allowing a stripper into the country for the evening would violate the Mann Act, because the visit would be "for immoral purposes."

Undeterred, we simply moved the party across the border into Mexico. We found the bar where our classmate had hired the dancer. It was a typical border town bar room with a live band, and we found plenty of girls there who would dance—for a fee. Our classmate, however, had already hired the most stunning woman there. She was a *very* good dancer. She pulled one of our classmates up onto the stage to dance and, as they moved together, they both began to strip. As each article of clothing came off, we became more and more mesmerized by this gorgeous girl. By the time she took off the last piece of clothing, we were all on the edge of our seats. And then, our jaws dropped. This gorgeous woman was, in fact, a man.

Our classmate, half naked on the stage, turned a shade of purple that I have never seen before or since, grabbed his clothes, and left. We scuttled back across the border and never said a word about it again. Not a word, that is, until now.

It was perhaps best, then, that we all went our separate ways to different assignments. This time, the move was at least blessedly short: about one hundred and fifty miles upriver along the Rio Grande to Laredo Air Force Base. Once again, we lived right on the border with Mexico. After my assignment to Moore, I hoped that I would be sent to a nicer location. But, like Moore, Laredo was another isolated spot. The only thing to do was train on the base. There was nothing else around.

In 1956, Laredo had not yet caught up with the twentieth century. It was still a Wild West town. We rented a house on a dirt road close to the base; few of the roads in Laredo were paved back then. We soon got to know our neighbors, mostly Mexican. The guy who lived next door to us went fishing in the Rio Grande about once a month and had a great neighborhood barbecue in his backyard. He snared some of the largest catfish I'd ever seen, and they tasted delicious.

Up until this time I had flown T-34 Mentor and T-28 Trojan propeller-driven training airplanes, but now I would transition into the larger Lockheed T-33 Shooting Star. At last I'd get to fly jets. Since there was very little in the area other than the base, we could do pretty much what we liked in the air;

no one would be bothered by aircraft noise. The route of the Rio Grande was obvious from above too, which made it easy to keep north of the border.

This base *smelled* different, a dark, oily odor that seeped into everything. Jet fuel smells a little like kerosene, and the busy base had tanker trucks driving around filling up the hungry airplanes. I never escaped that smell, which was fine: I loved it. It meant I would be flying soon.

Flying an airplane with a piston engine was one thing; piloting a jet was quite another. It was a little like going from driving a standard car to competing in NASCAR. The first time I strapped myself into a T-33 jet with an instructor in the back and took off, I remember thinking, “Holy crap, this thing can really move!” I also clearly remember my first solo in a T-33. I headed up to twenty thousand feet and circled for an hour, scared as shit, getting used to the feel of the airplane. It was a whole different sensation. No big propeller sticking out in front of me, and the cockpit was a lot smaller and tighter. Once airborne, I felt like I just glided through the air; the speeds were quite different, and the ride much smoother. Although I could make a much tighter turn in a small piston-driven aircraft, I felt the acceleration in turns much more in a jet as the airplane’s sheer power and speed squeezed me down into my seat. Like driving a car, the more I did it, the easier it became.

We had great instructors—mostly. Many were only just ahead of us in their training, with perhaps a few hundred hours of flight time. Yet some got a little impatient with us. I remember one young instructor who, even though some of us probably outranked him as West Point graduates, made us stand at attention and salute every time we saw him. It was done to remind us that he considered us subordinates. He didn’t make for the best teacher. In fact, one of my classmates was having trouble passing the course, to the point where they pulled him in front of an official review board. Curious, I went along to see what the review was all about. After his instructor spoke, they asked the student if he had any comments. He said yes, then pulled out a roll of toilet paper on which he had written his remarks, rolled it across the floor, and began reading from one end. He had kept copious notes on everything that particular instructor had said or done that had caused him confusion and affected his flying performance. After a few minutes, the tribunal board members stopped him and told him that they would give him another chance to pass. I loved the shamed look on that instructor’s face.

We had another instructor who was extremely memorable, for different reasons. A fighter pilot during World War II, he insisted that we all drink with him while he showed us gun camera footage from his low-level flying attacks on Nazi airfields. He was a maverick and he knew it. In fact, he seemed to revel in the likelihood that he would never be promoted. He’d even bent the points on his major’s insignia, stapling his rank permanently to his shirt collars. I remember one day in particular when he pulled a stunt with a T-33 that was sitting out on the ramp. Maintenance was not finished on the airplane—in fact, the tail section had been removed—but he jumped into the aircraft and taxied out anyway. The ground crew frantically tried to wave him down before he could take off, but his attention was distracted by a rattlesnake crossing the ramp. He twisted and turned the airplane around trying to run it over, and ignored all radio calls as he headed out to the runway, pretending to prepare for takeoff.

As the control tower screamed at him to stop, he throttled the engine up to full power and sped down the runway, while the base crew went on alert and prepared for a crash. Then, at the last moment, he slammed on his brakes and returned to the ramp as if nothing had happened. That was his idea of a great prank, and the kind of stunt that guaranteed he’d never be promoted. Yet, for all of his craziness, he was a great instructor.

Under the intense pressure, many students washed out. They were very capable, but they would not all make it as pilots. Many became navigators, while others returned to college, studied for advanced

degrees, and became technical officers or worked on guided missiles. All had important roles to play in the air force. I was glad it didn't happen to me, however, as I loved to fly jets. I was doing just fine and concentrated even more on instrument flying, becoming increasingly proficient. When the second phase of training ended at Laredo after about eight months, I chose the Air Defense Command for my advanced training. It meant I could train for all-weather flying, when relying on instruments would be crucial.

For my advanced instruction I trained on a specific airplane and learned not only how to fly it but also how to operate its weaponry. I learned more about radar and guided missiles, while gaining additional technical expertise. This time I was assigned to Tyndall Air Force Base, close to Panama City at the northern end of Florida. Pam and I found a small house close by in Mexico Beach. After our recent postings right on the border, the name seemed appropriate. It was a beautiful spot, where we walked on the sand and swam in our free time. I was beginning to get used to the frequent moves that a military career entailed. And since I had to abandon Pam during the day to her own devices, living in such a pretty spot eased my sense of guilt.

At Tyndall I was assigned to the F-86D Sabre jet, manufactured by North American Aviation. Even in the mid-fifties that aircraft was pretty old, and after about a year and a half they gave us newer airplanes. Still, I could learn a lot from the F-86. Since it was a single-seat aircraft, my first flight had to be performed solo. That was quite a thrill, especially when I lit the afterburner. I heard some guys say they could make the F-86D go supersonic if they flew it in a steep dive at full power. It was a wonderful airplane, perhaps the greatest in the world at the time. With the increased speed and complexity of the aircraft, however, I had to be even more focused in my flying. It wasn't that I needed a quicker reaction time; I just needed to think further ahead. I had to anticipate all of the things that could go wrong and stay ahead of the airplane in my thinking.

I practiced low-level approaches and landings in bad weather in that aircraft. In fact, I earned a special license that allowed me to land when the weather was so bad that I could see nothing outside the cockpit at all. Such a license was extremely unusual because there was little support other than voice commands to assist a pilot from the ground in such weather. I also learned how to operate the radar system and how to go after a target. I learned the best air combat techniques in a very scripted way: we would climb up to the right altitude with a team on the ground supporting us on the radio, while other airplanes towed targets. The ground control told us which heading to take until we were almost on a collision course. At a precisely defined point, I would fire the Sabre's rocket armaments. If we'd calculated everything correctly, I hit the target.

The air-to-air combat maneuvers were nothing like dogfighting. Instead, I had to place the target on my radar screen, using a hand controller to move a little cursor until it covered the target, and lock on to it by pushing a switch on the control stick. The system would then begin to calculate the correct approach path and how far out to fire the rockets. Next, I would switch to a different mode where I'd keep the target in the center of the screen. If my target started to move away from the middle I'd maneuver the airplane to keep it centered. Sometimes, the target moved so quickly that I had to fly upside down in a crazy barrel roll just to keep up with it. I was comfortable with this control system, and my skills as a pilot greatly improved during this phase of training. I really enjoyed working as a combined unit: human and machine in precise harmony.

You might be imagining a squadron of close buddies, flying wingtip to wingtip. Not us. We launched solo and headed off in our own directions, spreading out so we could look for targets over a wide area. I practiced endlessly, like a student in medical school, honing my skills and experience. But it was mostly solitary learning, which was fine; I was confident and had always relied on my own



abilities, not others’.

Training for different kinds of weather was far more challenging in Florida. With all the humidity, we had a lot of turbulent weather. We even had a hurricane come through, and rather than risk damage, the experienced pilots tried to fly the airplanes to other bases, while we students evacuated to the relative safety of the officers’ club. I remember standing in the front door of that club as the power failed, watching streetlights and electrical transformers dramatically arcing and sparking, thinking I was lucky to be alive. While the other pilots evacuated the airplanes, some collided in midair due to the terrible weather, and four jets, four pilots, all gone in one terrible accident.

Even though we were not in a combat zone, it was a dangerous life. I knew it could have been me who died that day. I understood that risks were part of my job, but incidents like that terrified Pam.

That made sense: she was on the outside looking in. As much as I wanted to share the excitement of my career, she couldn’t experience it with me. And when it came to dangerous incidents, like many young, dumb guys I thought it would make her feel better to discuss them, to explain them. Of course, I was wrong. My clumsy attempts to reassure her only increased her fears. I had changed since West Point—risk was part of my everyday routine and no big deal to me. For her, it was the thing that could kill her husband at any hour of the day. How she endured it, I don’t know, but she stuck with me as I dragged her from one military base to another.

The Space Age began in 1957, with the launch by the Soviet Union of the first satellite, *Sputnik*. I paid little attention, however. Pam and I were moving again, this time to my first post-training assignment, just southeast of Washington, D.C., with the 95th Fighter Interceptor Squadron at Andrews Air Force Base. Less than two years earlier I had piloted my first airplane, and now I was a jet pilot defending my country’s most vital assets.

My mission wasn’t called Homeland Security in those days, but essentially that’s what it was. They called our squadron “Defenders of the Nation’s Capital.” However, that grandiose title was a big joke, because for a long, long time we could hardly get an airplane off the ground. We just didn’t have the ability or the resources to keep them maintained. The Korean War had been over for many years, and the nation was scaling back on military spending. The air force was in a slump at that time. We did not have a good supply system for parts to keep our airplanes flying, and it didn’t help that we still flew those old F-86Ds.

Still, in theory, our squadron was part of the air defense command system, designed to guard the nation from airborne attack. Specifically, we were ready to defend the capital from long-range assault. Control centers all over the country, using long-range radars, calculated our intercept courses and told us where to go if they considered any incoming aircraft suspicious. Rather than engaging in combat overseas, we were prepared to oppose anyone who tried to attack the United States. In the middle of the Cold War, it felt like that attack could happen anytime.

President Eisenhower and Soviet leader Nikita Khrushchev were engaged in a propaganda war in a fast-changing world. Both countries had nuclear weapons, and Eisenhower used their existence to keep the Soviets at bay. If events became too heated, both nations could destroy each other. In a time before large and reliable rockets, nuclear bombs would be dropped by waves of aircraft. It was our job to stop the Soviet planes.

Our targets would have been the big bombers. We had air force squadrons stationed everywhere, up along the border with Canada, in Greenland, and in Alaska, as a perimeter defense of the nation. We were trained to intercept those incoming Soviets as far out as our airplanes could fly, and to knock them out of the sky before they could get close to American shores. I’m glad that we never had to do what we were trained for.

All of my previous flying was in a training environment, but now I was in an operational environment. We stayed on alert just like firefighters, sleeping in bunks and ready to fly into defensive action. It felt very different from training. And once again, as the new, green pilot, I started at the bottom of the heap and had to work my way up.

Pam and I could finally afford to buy a home, in the District Heights area close to the base. It cost us more than thirteen thousand dollars, a fortune in those days, but it was a beautiful brick house on a pleasant street and we loved it. I wasn't paid much, but we got by. In fact, I think we had more disposable income than I have ever had since, because we had so few expenses. After the frenetic years of moving, I felt I could finally give Pam a moment to breathe, and a little stability.

It also seemed like the right moment for us to start a family, and in 1958 we had our first child, Merrill Ellen. We gave her my father's first name, which is also my middle name. I wasn't totally sure it could be used as a girl's name, too, but there were a lot of women called Meryl around, so we figured we could get away with it. I was extremely excited to become a father, and it was a very special moment when we visited my family back in Michigan with our new baby.

Nevertheless, my career still consumed me. In my second year at Andrews, the air force finally gave us new fighters, high-altitude supersonic interceptors called Convair F-102 Delta Daggers. These airplanes were specifically designed to defend the United States, and yet we still didn't fly much. With the new focus on nuclear warfare, the air force was given little money for spare parts. We had a hard time keeping our airplanes flying. We'd cannibalize one F-102 to repair another, and plenty of aircraft just sat in the hangar and looked pretty, because they couldn't fly. A lot of the pilots sat around, too, killing time, drinking coffee, and playing Ping-Pong.

I was disenchanted by the lack of focus and flying time. But there was more to it than those factors: there was added tension within the squadron because of two very different generations of aviators. My flight commander and the other senior officers in the squadron had advanced through the ranks during World War II, a decade earlier. They'd been let go at the end of the war, but pulled back in to fly in Korea. Many hadn't flown for years, and when they did it had been propeller planes. They learned to fly jets relatively late in their careers and were cautious and uneasy about jet aircraft quirks. Little things in the air made them jittery, and I kept a wary eye on them when flying close by.

Despite my caution, I respected their years of experience. I didn't get it in return. Most had never been to college, and they resented those who had. They particularly disliked West Point graduates, believing that we received preferential treatment over war veterans. As there were only two of us in my squadron, we were easy to single out. I gritted my teeth and said nothing—for a while.

My superiors also wrote efficiency reports about me, which went in my military record. These reports were always good overall, but I was still convinced that my flight commander knocked me down a little simply because I had gone to West Point. A report that was merely okay would slow my chances of promotion. I vented my frustration in a private letter to Jim Allen, the tactical officer at West Point who had convinced me to become a pilot. He wrote back and told me that if I decided to resign I would be giving in to those people, who would then be in total command of the air force. He advised me to stick around, both for me and for the service. Jim was a clever guy, who ended up heading the Air Force Academy. It was some of the best career advice I have ever received.

I didn't waste any more time sitting around drinking coffee and talking to those guys. I began to wander around the hangar more and more. Just as I had been curious about taking car engines apart and putting them back together as a teenager, I was eager to see what went on with airplane maintenance. I hung around the maintenance crews, talked with them, and grew even more fascinated. There were storage areas for munitions, guided missiles, folding fin rockets, and other amazing

things. I wanted to know it all inside out. The guys who worked there, however, told me that they were having problems. They could never get the attention of the officer in charge, as he was always in the lounge with the pilots, relaxing with coffee and cigarettes. They were left to flounder on their own, and as a result the squadron received poor readiness ratings. It was not a good time to be so disorganized, because the air force was adding a special weapons storage facility, which meant we'd be able to have nuclear weapons on-site.

The squadron commander was aware of the problem and noticed my interest. He finally came to me and said he wanted to make some changes, and they involved me. He told me to take over and run the armaments and electronics shop. I had no idea of the scale of the problem when I began, but once I did my weekends were gone. I put in 120-hour weeks sorting out the mess, in addition to being on constant alert as a pilot for three-day shifts. With the help of my senior master sergeant, I put in all my time reorganizing.

The working conditions were deplorable. All the sensitive electronic repairs took place in a lean-to shed that wound around the back of the hangar wall. It was filthy, and despite the sweltering summer heat it had no air-conditioning. So we approached the Convair company, which built our F-102 airplanes, and Hughes, which built many of the weapons systems, and asked a question they had never heard before. We told them that if they would buy the materials, we would rebuild the armament shop. They saw that we were serious and agreed. It took a while, but we put in sound-absorbent ceilings, fluorescent lights, air-conditioning, brand-new workbenches, and a gleaming tiled floor. The place looked like a medical operating theater when we finished. The tools and all the test equipment were where they were supposed to be, and there was no longer any confusion about who did what. The whole operation turned around, and our air force readiness rating jumped from very low to very high.

It turned out that we fixed up that shop just in time. In 1960 we upgraded to the F-106 Delta Dart, dubbed the "ultimate interceptor" airplane. This sleek jet was an advanced version of the F-102 design, with a more powerful engine. It also had an almost completely integrated electronic flight system, with navigation, radio, munitions, and the flight-control systems in big racks. The F-106 was complex and needed the efficient maintenance facility we now had. Because we were so organized, when the air force demonstrated the airplane to senators, congressmen, and others from Washington, they frequently used our facility.

Our second child, Alison Pamela, was born that year. Many fathers would try to be at home and spend more time with two young children. I focused more on my job. I rationalized the decision by saying it was good for my career—and it was. But, to my regret, I missed a lot of my daughters' precious early years: time that once lost is gone forever.

Luckily, Pam was a wonderful mother, who could fill in for my absence. I don't remember her ever complaining about me being gone all the time. Perhaps it was my own guilt that I did not spend more time with my family and was not more of a father when my kids were small, but I suspect that a sense of unease crept into our marriage at that moment.

Up until then, despite any hardships, we had made it through on the understanding that we lived the roving military life. I don't think Pam expected that things would change when we had kids, but I believe she became increasingly wary about what I was doing. When we married, she was a little upset that I chose to join the air force. She didn't really want me flying, because there is an obvious element of danger to it. I am sure she must have struggled with the fears that all aviators' wives have, and the pressure to not outwardly show them.

Then I got into the all-weather fighter business, which was not like flying cargo airplanes—it was

far more dangerous. Adding to that stress, I was away from home and flying city alerts in the middle of the night. No wonder it was a tense time for her. I was getting more and more into my work, and she had the frustration of covering for me at home because I wasn't there.

I understand now that Pam needed me to slow down. To reconsider what was most important to me. To invest in my new family. Yet I have to admit that I was oblivious to her worries at the time; I was so caught up in my career. The Air Defense Command came and inspected our maintenance work, and enthusiasm grew about the great job we had done. They particularly appreciated that the contractors, rather than the air force, had paid for most of the rebuilding. Soon I received a phone call summoning me to headquarters. They wanted me to visit all of the other air bases, talk with them about what we had done, and work with them to do the same.

I was grateful for this validation of my work, but it wasn't what I wanted to do. If I had to sit at a desk somewhere, I didn't want to do it at Air Defense Command Headquarters. I wanted to make a choice that would benefit both me and the air force. So that day I jumped in my car, drove to the Pentagon, and requested that they send me back to college to obtain an advanced degree. At first, the officers I talked to wanted to send me to North Carolina to study nuclear engineering. No, I countered, please send me to the University of Michigan. In fact, I begged and pleaded to be sent to Michigan, to study aerospace engineering. It worked: they enrolled me.

Before we moved back to Michigan, I had my first brush with the space program. The pilots in my squadron all gathered in our coffee room in May of 1961 where we planned to watch the live television reports as NASA attempted to put Alan Shepard in space on America's first manned flight. Just before his launch, we heard that there was an emergency back at our airfield. Our maintenance officer was trying to land an F-102 fighter, but he couldn't get the gear down. He would have to land the airplane on its belly. We needed to decide whether to watch the historic spaceflight live, or to take our hot dogs out to the runway and watch the crash. We decided that we could always watch the launch later on, in repeats, but the crash would be unique. So we forgot about the space program for the next few hours, far more pleased to see our maintenance officer return safely to earth than any astronaut. Sorry, Al, it was nothing personal.

We also played a trick on one of the flight commanders in our squadron, an old, crusty pilot who had never been to college. We had someone from the Pentagon make a prank call to inform him that he had been selected for the astronaut program. We kept the joke going for two weeks, and the guy was just walking on air while we congratulated him over and over. When we finally told him the truth, however, I think he was a little relieved, because he knew that he didn't have the experience needed to be an astronaut. It goes to show that when the manned space program really got going, it meant little to me other than a way to play practical jokes.

I hadn't distinguished myself academically my first time at the University of Michigan, and in truth I was amazed that they accepted me into graduate school. I quickly discovered how much I needed to catch up; that first summer was unbelievably tough. I took a math course with around a hundred students, and more than eighty of them were high school graduates who knew more math than I'd ever learned. In the years since I had left West Point, the instruction in high school had advanced so much that these kids were way ahead. I broke my back studying to catch up. It took me a year to feel comfortable.

I wanted to go back to Michigan because they had a course specifically for air force officers, with a focus on guided missiles. The course was quite specific to what the air force needed at the time. Ballistic missiles were becoming crucial to our national defense, and rocket airplanes were being built that could reach the edge of space. This was clearly the wave of the future, and I could see that it

was better to be ahead of the wave than behind it. Most people in the class went on to work with ballistic missiles, but other pilots like me hoped to go into high-performance flight work. I wanted to learn as much as I could about subjects like control systems, instrumentation, and rocket propulsion. We did a lot of space-related work, which was important for both ballistic missiles and manned spaceflight careers. We also studied a great deal about trajectory analysis, orbital mechanics, and rocket propulsion. I didn't plan to become an astronaut, but nevertheless I learned much of what I'd need for the job.

I also thought about my air force career beyond being a pilot. Any good air force officer doesn't obsess about flying. The air force is a management organization, and I looked forward to steady progression through the ranks. At some point that would mean I'd have to leave much of the flying to those under me, and I wanted to learn the necessary management skills.

Once in Michigan, we rented a house only thirty miles from my parents' home, which was great. Although I'd been happy to leave, I had still missed my family and it was good to be close again. For Pam and the girls, however, it was the same sad story. On the whole, going back to college was a huge mistake. I was busier than ever, and it meant even less time with my growing family. When one parent is away all the time, the other parent has a tough job. If that parent doesn't complain, nothing changes. If the parent does complain, however subtly, the children will pick up on that feeling. The only way to ease that tension would have been for me to cut back on a career that was advancing rapidly, and I didn't want to do it.



*With Pam and our daughters Merrill (left) and Alison, in Michigan in 1962*

I had so little home life because I was not just studying: I was also the air force operations officer for all of the other pilots at the college. In my two and a half years there, I had to give around thirty students their check rides, instrument training, and schedule their flying time. Add to those responsibilities studying for master of science degrees in aeronautical, astronautical, and instrumentation engineering, and it is little wonder that I was so preoccupied.

Meanwhile, I looked ahead. I discussed my next move with two other pilots studying at the college.

Jay Hanks was the head of academics at the test pilot school at Edwards Air Force Base in California, and Bob Buchanan was the deputy commandant. I spent a lot of time with the two of them, and the more I learned about their work, the more I realized that test pilot school was a natural career path for me. It was the top of the ladder for all active aviators. I'd have a chance to further understand the airplanes already in use in the air force, while testing aircraft not yet in service. This experience would put me ahead of the curve, and position me for even higher-ranked air force positions.

My hard work in Michigan paid off academically, and by 1963 I was all set to graduate from college. Bob and Jay had both strongly encouraged me to apply for the next test pilot school class. So I did, and hoped that such highly placed backers would ensure I'd soon be in California, testing the newest and hottest jet fighters. Yet a couple of months later I read an announcement listing the class members starting at Edwards that year. My name was not on it. I could have been upset, but instead I remained philosophical. Forget about it, I told myself, you just didn't make the cut.

About a week later, the secretary of the air force called me. Had I seen the list of people selected for Edwards, he asked, and had I noticed I was not on it? Yes, I replied, wondering where this call was going. To my surprise, he told me the air force had deliberately taken my name off the list. They had an exchange program with the Royal Air Force over in England and had decided to send me there instead. The exchange program had never been a great success because the American pilots had been unable to meet the academic standards the British required. My superiors had looked at my records, seen that I had a solid academic background, and thought I'd be a perfect fit. It sounded like a great opportunity.

I had a six-month wait before the assignment in England began. Talking it over with some air force advisors, they thought that it would be helpful for me to go through an instrument pilot instruction course while I waited. Flying in England would mean bad weather. Plus the British did not use radar; they relied on directional radio beams to pinpoint aircraft positions. I would have little help when judging my position in the sky. So at Randolph Air Force Base, close to San Antonio, Texas, I spent a few months practicing flight using only instruments. After a couple of years living in one place, my family was leading a nomadic life once again.

Before we left for England, I heard that NASA was accepting applications from jet pilots to become astronauts. It sounded like a good way to enhance my career, so I sent in my paperwork. I figured that I had nothing to lose. While I still wasn't a test pilot, I had accumulated a lot of flying time and some good reports from my superiors. The answer I received back said, essentially, that timing was not in my favor. They wanted to talk to me, but I was going on an exchange program and they couldn't interfere with my orders. I figured I would be in England for at least three years, and older than NASA's age requirements by the time I returned. So, forget it, I thought: it just wasn't in the cards for me to become an astronaut.

Pam and I decided that all four of us would live in England while I attended the Empire Test Pilot School at Farnborough, in the south of the country. We also decided that if we were going to spend time in a foreign nation, we would not hide in an American compound and pretend that we were still at home. Since I was on exchange to the RAF, I would live as an RAF officer. The whole point of the program was to create good connections between the two nations, and living in the English community, rather than segregating ourselves like most American pilots, seemed like the best way to do it.

When we first arrived in England in a military aircraft, a very helpful and friendly air force officer from Oklahoma met me at the bottom of the steps. His name was Bill Pogue, and he was also in the exchange program. Bill had been asked to welcome us to England and make sure we got to our

destination in one piece. After a brief chat where he shared some helpful tips about the school, Bill put us in a car. That was the last I saw of him until a couple of years later, when he turned up again at the astronaut selection physical tests.

Some of the officers who had gone over earlier paid hundreds of dollars a month in rent to live in an American enclosure, a huge amount of money back then. Instead of living with Americans, I asked my RAF counterpart who made my moving arrangements to find us an English house to rent. He located a beautiful five-bedroom bungalow in Crookham Village, with a large vegetable garden in the back. It was quite close to the air base at Farnborough, in the pleasant rural county of Hampshire, and cost about a fifth of the rent for the American compound. In such beautiful surroundings, I no longer felt sad about missing out on an Edwards assignment in the dusty California desert.

My family became completely immersed in the British way of life. We went weeks at a time without seeing another American except in my classes. Our two daughters started school, and because they were still so young, they picked up English accents amazingly fast. To our amusement, Pam and I found that we now had two children who sounded like they were born and raised in Hampshire.

It was a fascinating time to be in England. In 1964, after years of austerity following World War II, the country was coming to life again. You could feel it in the music; the Beatles were really making a big splash. Every Friday night we would have a party at the officers' club. They'd pack a hundred people into a tiny room, play Beatles records, and we'd party all night long. I still consider my British friends to be the best I ever had.

Even though we lived in England, we threw a Fourth of July celebration at my house. A little insensitive, perhaps; after all, the British lost that war. However, I wanted to show my English colleagues how we Americans could throw a good party. My whole class came over to my home, as well as all the instructors. We had cold American bottled beer, hamburgers, hot dogs, and potato salad exactly as we would have served it in the States. At that time in England, these dishes were pretty exotic. Although the English pilots insisted on calling us "colonials" that day, they had a great time. The commandant of the school even showed up, in a full dress uniform with white gloves. He probably regretted that when he began to run around, playing a game where we threw raw eggs over the bungalow while others tried to catch them on the other side. Those white gloves didn't stay clean for long.

The British taught test flying very differently than Americans. We had to do everything by hand; there were no electronic recording devices. Back in the States, a big control room recorded the test data. In England, I measured data myself, took my own notes in the air, and wrote my own reports.

Some may have thought the American, more high-tech approach was better, but I didn't. I had to really *think* about what I was doing while learning to test fly in England, rather than rely on the ground to record everything for me. Perhaps because I enjoyed a hands-on relationship with cars and other mechanical things, I found this approach far more interesting. A handheld gauge told me precisely how much force I exerted on the stick when I pulled it, and I would use this in the air together with a tape measure and a notebook while carefully testing the aircraft. I could directly measure what happened whenever I made the slightest adjustment to the airplane. It sounds old-fashioned, for a pilot to be fiddling with a handheld force gauge while flying a jet, but by personally reading off the forces I placed on the airplane, I felt even closer to the machine. It was incredibly valuable, because I learned what it took to make each aircraft perform at its best.

I don't recall any of my American colleagues looking down their noses at this more direct testing method. In fact, we all really appreciated our time in England because, if we had been in the United States, we would only have been allowed to fly two different types of aircraft, maximum. At

Farnborough, I flew at least thirteen varieties, from a tiny de Havilland Chipmunk propeller airplane all the way up to a Vickers Viscount airliner that could seat around fifty passengers. We flew a wonderful diversity of unique aircraft with intriguing names like Provost, Devon, Dove, Canberra, and Skyhawk. We even flew gliders: it was pilot heaven. The British philosophy was that we were pilots, so we should be able to fly anything. It was quite different from the American mindset of specializing in one kind of fighter jet.

Most of the time, we flew Hawker Hunters or Gloster Meteors. The Meteor was the first operational British jet fighter and a potentially deadly airplane—not only for the enemy, but also for the pilot. It was tricky to fly, and in certain flight conditions the Meteor would become unstable and almost uncontrollable. The Hawker Hunter, on the other hand, was one of the best airplanes I ever flew. It was smooth, comfortable, easy to fly, yet very powerful. I loved to spin upside down and watch the world rotate around me. I fell in love with that airplane, and flew as many of my test exercises in it as I could.

At Farnborough we'd start the day with academic sessions, then have lunch, often with a pint of beer, before we suited up and went flying. There were some British flying practices that weren't necessarily better—in fact, I am sure they don't do them anymore—and drinking before flying was certainly one of them. But that beer accompanied some of the most wonderful lunches I ever had in the military. I learned to love eating fish while I was in England, and I have never had Dover sole as good as I had at Farnborough. We'd finish up the lunch with a traditional English brandy-soaked trifle dessert with custard, empty our beer glasses, and head down to the operations area to go flying. Once there, we had one more lunchtime treat before we'd take to the air. The cleaning lady at the flight line office always had a big mug of hot tea ready for us. It was the strongest tea I ever tasted: you could probably have stood a spoon up in it. It was the perfect refreshment before a long flight and probably also helped counter any bad effects of the lunchtime alcohol.

Farnborough was my first time living overseas, and I loved it. I didn't have to learn a new language, which made adapting easier. As part of the training, we students traveled all over the island. We would pile into the Viscount and head off to airplane manufacturers in towns like Blackpool and Edinburgh. We'd visit anywhere and anyone related to aviation. I also found time to take Pam and the kids on some great trips to places like Bristol, Lancaster, the beautiful castles of north Wales, and the lovely city of Chester with its impressive Roman and medieval city walls and buildings. Learning how to drive on the left was intriguing enough. But even the roads were different. Some followed the path of old Roman highways, which would cut across the landscape in a straight line. Others, English-style roads, wound around the contours of hills, so there were few rises and dips to negotiate.

To get around, I bought a Volkswagen Beetle. Like all cars in England, it was a stick shift. I drove to the store at South Ruislip Air Station every week to buy groceries and also to do something a little extra: I was the unofficial supplier of liquor for my British colleagues. With coupons from the American Embassy I could get it at the air force store for a dollar a bottle. English ladies had a particular liking for straight shots of tequila, so I had to buy extra bottles every week.

I soon realized, however, that Pam didn't want to drive the car. In my haste, I had never asked what kind she would feel comfortable driving. When we finally talked about it, I learned that she was frightened to drive on the left-hand side of the road. She also didn't want to learn how to change gears. So I compromised with her and traded the Beetle for an American Oldsmobile station wagon with an automatic transmission.

It was only a little thing, but it symbolized our growing disconnection. I found it strange: it seemed



that she did not want to join me and fully adapt to British life. In fact, she felt a little intimidated by life in England. While I tried to do everything I could to make her comfortable, I increasingly felt I was alone in my interests and ambitions. The last thing I wanted to do was give up exciting opportunities and settle for comfort and familiarity, but I felt I was subtly being asked to do just that.

I graduated second in my class at Farnborough. Not long before I did, the class from the test pilot school at Edwards came over for a visit. Among them was Chuck Yeager, a legend in the test piloting world because he was the first person to fly faster than the speed of sound. Now, almost two decades later, he was the commandant of the Aerospace Research Pilot School at Edwards, which trained pilots and engineers to test new and experimental airplanes. I didn't know him personally at that time, but I had been told a lot about him. One of the stories was that he didn't like pilots with a lot of education. Like a lot of World War II veterans, he'd never been to college himself. So it was a surprise when, almost as soon as Chuck stepped off the airplane, he tracked me down, introduced himself, and said that he needed me to come back and teach at his school.

It was a flattering offer, but I had to tell him that I didn't know if I could accept: I was in a formal three-year exchange program. I was scheduled to leave soon for another British flight test center, RAE Bedford, where the British were developing vertical lift aircraft. I would test vertical takeoff maneuvers and equipment. I was looking forward to this two-year assignment, because they had some really interesting and innovative testing going on.

I could tell that Chuck wasn't going to take no for an answer. He spoke with the commandant of the test pilot school, who in turn discussed it with the British defense ministry. They approved my return to the States, but the U.S. Air Force was still nervous about accepting. They didn't want to do anything that might upset an international exchange program. I believe the discussion went all the way up to the secretary of the air force before it was agreed that I would return to the States. In the meantime, I had graduated from the school, and no one had any idea where to assign me.

While the decision was made, I marked time at the exchange office of the American Embassy in the center of London. I was placed in a small rented office above a Wimpy's hamburger café, a couple of blocks from the embassy. It was frustrating: I wanted to keep flying, but instead I was stuck at a desk. There wasn't much for me to do except for some nonsense paperwork, so I walked around and enjoyed London instead. It was Christmas of 1964, and the big stores gleamed with colored lights. It was the last calm moment in my career for a very long time.

I was commuting into London from Crookham Village every weekday by train. One morning, I spotted a familiar face at the station: Robbie Robinson. He was a British pilot who had been on exchange duty in the United States doing top-secret work before becoming an instructor at Farnborough. Years later, it was revealed that he'd flown highly classified missions in U2 spy planes over the Soviet Union's rocket testing sites, which the British officially denied at the time. I always had a lot of fun with him, as we got along so well; he had a great sense of humor. This morning would prove no exception.

Robbie sidled up to me, we exchanged glances, and he whispered, "Follow my lead." I guessed he had a prank in mind, so we entered the same rail compartment and pretended not to know each other. It seemed that no one ever talked on the train; they preferred to bury their faces in a newspaper. Robbie sat and read his paper, too. As the train started to move, he began to mutter to himself about the "damn Americans," as if a story in the paper had angered him.

I guessed that this was my cue. After a few minutes of his grumbling, I announced that I was an American, that he was insulting my country and needed to stop. He immediately argued back. We kept this act up for a while, and gradually the other newspapers in the compartment were lowered and the

passengers began to stare at us. As we neared London, the argument became more and more heated, and other people on the train joined in. Luckily, some took the American side, or I could have been in big trouble. As we pulled into our final stop, the other passengers were all arguing like crazy. With a final exchange of insults, Robbie and I jumped off the train and hid at one side of the track. We watched as the passengers came out, still quarreling furiously with each other. As soon as we were sure they were not looking, we laughed like hell. From then on, every time we rode a train together, we tried to pull the same trick.

After about six weeks, the British and Americans had worked out all of their paperwork. In the spring of 1965 it was time for me to head back to the States. My children, who by that time sounded completely English, went back into American schools. Surprisingly fast, they lost all traces of their British accents. We left the beautiful English countryside behind for the hot, dry desert of Edwards Air Force Base, northeast of Los Angeles. I felt a little strange: teaching at Edwards was an unusual arrangement. However, the test pilot school in England had taught me essentially the same skills I would have received in the basic flight test courses. I was given credit for the basic courses along with the students, while I wrote and taught the advanced courses. It was odd, graduating with the students I taught, but it suited everyone.

I always felt slightly nervous around my boss, Chuck Yeager, as I still sensed that he didn't like educated people much. It seemed to me that he let those immediately under him, such as his deputy Bob Buchanan, run the show while he went out having fun with his air force pals. From what I saw, he was a completely different kind of pilot than me, very good at flying by the seat of his pants, learning by experience and feel, but without much of the sophistication needed for flying the newer, more technically challenging aircraft. He was also extremely self-confident and unwilling to take good advice from others. Not much more than a year before I arrived at Edwards, Yeager lost an NF-104 airplane when he took it to the edge of the atmosphere and it went into an uncontrollable spin, forcing him to eject. No one dared say it around him, but everyone at Edwards thought that Chuck had pushed his abilities too far that day.

Chuck had been passed over for astronaut selection, too, because he did not have the mandatory college education, and he seemed to take this a little personally. Worse, the primary purpose of his Aerospace Research Pilot School was to breed future astronauts, a club he could never join despite being the world's most famous test pilot. Still, no matter how I felt about him personally, I was grateful that Yeager had pulled me right into studying and teaching techniques designed to train future spacefarers. We learned all about orbital mechanics and rocket flight in the classroom, then practiced zoom maneuvers in the air in F-104 aircraft, appropriately named Starfighters. Wearing full pressure suits, we flew trajectories similar to the flight path of the X-15 rocket plane, which could reach the fringes of space.

I'd start out at thirty thousand feet, dipping down slightly to pick up extra speed, and then once I was racing over Mach 2, I would pull up and coast to the edge of the atmosphere. There was little time to look out; I closely monitored my gauges, ensuring my wings were absolutely level and my engine stayed at a safe temperature. If the jet turned sideways, even slightly, my large canopy could have acted like a sail and spun me around.

The afterburner soon blew out, and above seventy thousand feet I shut the specially modified engine down before it overheated. Now running only on batteries, the airplane slowed. Reaching the top of the arc, pushing for one hundred thousand feet, slowly coasting, almost floating, I gradually let the nose of the airplane drop. At last, I had a brief moment to look out, and observe—*everything*.

I felt like I could see the whole world. The sun was white, burning with a cold, unforgiving glare

that highlighted every tiny scratch on my canopy. The sky was not yet black, but it was dark, and bright stars were beginning to appear. Below me, the earth was brilliantly lit. I could gaze from the orange desert of Edwards down across Los Angeles, past San Diego, and deep into Mexico, until the land and ocean finally disappeared in the blue, glowing haze of the atmosphere. Gazing into the deep, darkening horizon, I could see the slight curve of our planet's edge. It was eerie—and beautiful.

But there was little time to look. Above much of Earth's atmosphere, my still-rotating engine parts tried to act like a gyroscope and turn the airplane sideways into a dangerous spin. Carefully adjusting ailerons and rudder, I kept the wings dead level as I gradually nosed back down into thicker atmosphere. Restarting the engine, I'd dive down to a landing on the Edwards runway. If I could not get the engine to restart, I'd aim for the dry lake beds that dotted the area and attempt a landing there. The flight was a halfway step to space; I'd had a glimpse of a new frontier.

We also practiced landing without power, just like an X-15. We lined up with the runway at around twenty thousand feet; reduced the engine to idle; extended the speed brakes, flaps, and landing gear; and dropped like a stone to a landing. It was difficult, but after a few attempts we could usually land on a predetermined spot on the runway.



*Flying jets at Edwards Air Force Base, around 1965*

We were a mixed bunch of pilots. Many of us were in the air force, of course, but we had naval and marine corps aviators there, too. I was more of an outsider, because I came in as an instructor, but we all stood up for each other and were a very supportive group. We were being groomed to fly winged vehicles that would go into space, such as the X-15. The air force had recently canceled a proposed space plane, the X-20 Dyna-Soar. They considered it too expensive and difficult to develop. A new air force space program, the Manned Orbital Laboratory or MOL, was being developed instead. We also couldn't help but notice that many of NASA's astronauts came from Edwards and had backgrounds similar to ours. The space agency had been selecting astronauts since 1959 and flying them in space since 1961. Since the day I missed Al Shepard's spaceflight on TV, NASA's space program had progressed at an astonishing pace. By 1965 they were flying impressive two-pilot space

missions in their new Gemini spacecraft. Despite the promise of the MOL program, NASA was the only organization putting astronauts into orbit.

We had a bizarre spaceflight simulator at Edwards, shaped like a doughnut ring that could move in three different axes. When strapped into it, pilots could train for some of the spacewalk experiences of a spaceflight. One week, a couple of astronauts from NASA showed up to practice on it, and I was asked to help instruct them. Gene Cernan and Charlie Bassett were assigned to the forthcoming Gemini 9 mission: Bassett planned to make a spacewalk, and Cernan was training as his backup. Charlie had been through the test pilot school at Edwards himself only a few years earlier, and he impressed me right away. I flew with him that week and learned that he was an incredibly good pilot and a friendly guy whom I chatted with a lot. Meeting him made me think how good it might be to join the astronaut group at NASA. If I were really lucky, I might even fly a mission with Charlie. A number of fellow Edwards pilots probably had the same thought that year: Ed Mitchell, Stu Roosa, Charlie Duke, Bob Crippen, Dick Truly, Hank Hartsfield, and Bob Overmyer were all at Edwards around the same time. Although it took some of us many years, eventually we all made spaceflights for NASA.

It surprised me when, less than a year after arriving at Edwards, I heard an intriguing announcement: there would be another opportunity to apply to become an astronaut. NASA was looking for pilots for its fifth intake, and in September of 1965 a number of us applied. There were actually two astronaut groups we could apply for: NASA's group and the air force's own MOL program. The air force had chosen the same moment because they didn't want NASA to take all of the top pilots. You could apply to one, the other, or both programs at once. I applied to NASA only; I figured the air force would steal all of the best pilots from the dual selection but would never get their own space program off the ground. I didn't know much about NASA yet, but I knew the air force didn't have a good track record for that kind of program.

I applied to become an astronaut because, professionally, I figured it couldn't get any better than that. Even being a test pilot couldn't compare with becoming an astronaut and making a spaceflight. That also seemed to be the general feeling amongst Edwards pilots. I knew that I was only able to apply because Yeager had pulled me back to the States; otherwise I would still have been in England for this selection period. I was thirty-three years old, not far under the maximum age limit, and if I didn't make the cut I'd probably be too old for NASA's next intake. This was my last chance, and I knew it. I sent in the required stack of paperwork, including military efficiency reports, flying time, and a complete résumé—then waited.

While I hoped for an acceptance letter, Pam was distressed by my decision to apply. Our relationship had already been weakening. Test pilot school had created a big problem between us because my work became increasingly dangerous. My astronaut application was a breaking point. Pam just could not handle it.

I had to weigh everything in the balance, however, and decide what was best for us. Could I turn down the chance to fly in space? No, I couldn't. That was the short, difficult answer. They say that hope is not a plan. I guess that is true. Still, I hoped that Pam would come around in time and support me.

Ironically, I had just spent a decade flying during one of the safest possible times for air force pilots. I began my piloting career after the Korean War had ended, and until 1965 America's involvement in Vietnam was relatively low-key. When I applied to NASA, however, the Vietnam War was escalating dramatically. If NASA did not select me, I would soon be flying in combat in Vietnam, which is exactly what happened to most of my classmates and friends. I seriously doubt that I would have had a less risky life if I had never applied to NASA.

In January of 1966, when I was invited down to the Aerospace Medical Health Center at Brooks Air Force Base in San Antonio, I knew I was in the running. NASA received applications from hundreds of qualified pilots, but only around seventy-five of us—less than a tenth of the applicant pool—were chosen for medical checks. My roommate for the tests was another Edwards pilot named Bob Lawrence, who had recently graduated from the Aerospace Research Pilot School. We spent ten days together, and I got to know him well. He was one of the nicest, down-to-earth guys I ever met. However, I guess he applied for MOL, too, because the air force pulled him into their program. Less than six months after he was selected, Bob died in an F-104 aircraft accident. Pam had a point: it was a dangerous business.

The physical testing at Brooks was brutal. The doctors stuck a pin in my shoulder and a pin in my wrist to measure the speed of electrical current between the two points, then thrust my hand in a bucket of ice water to see what happened. I wondered what this procedure had to do with flying in space or testing my health. They ran us through test after test of crazy stuff, whatever torture they could conjure up, it seemed.

The doctors also gave us about three days of psychiatric testing, which in my opinion didn't tell them anything either. They asked us some of the most inane questions, which you would only answer differently if you were clinically insane. We'd stare at inkblots and describe what we saw. We were shown all kinds of goofy pictures, even a blank piece of paper, and asked to describe them. At the outgoing briefing I asked the psychiatrist what possible use it all was, and if it actually helped weed anyone out. He told me they could only drop someone if he were insane. If he were just a little odd, they couldn't stop him, only make a recommendation. It was craziness, and worthless information.

I didn't prepare for the psychological testing at all or try to figure out what they might ask me. I decided that if I were sane, then great, and if not they would find out. I never worried about it. I was more concerned about them finding any disqualifying condition related to my blood-pressure problem or mysterious "rheumatic heart" diagnosis from my childhood. The doctors found nothing wrong with me at all, which was a dual relief, as a bad result could also have affected my air force career.

I was never told exactly how many of us were in the running, but I believe the medical testing cut the candidates down to about fifty. In February, we were asked to go to the Rice Hotel in Houston, Texas, for a series of written and oral exams. There we wrote essays about trajectories and flights, pretty basic questions compared to the work we did at Edwards. The second day, we met the interview panel for some head-on discussions. One of the pilots on the board was Mike Collins, who had been at Edwards before he was selected as a NASA astronaut in 1963. Seeing Mike there, someone who I really admired, made me want the astronaut job even more.

During the testing, we heard some terrible news: Charlie Bassett, the astronaut I had helped to train not long before, had died in an airplane crash, along with fellow astronaut Elliot See. I was stunned and could only repeat to myself, "Oh shit, what happened?" I was left with a sense of both amazement and shock that Charlie was gone. He was one of the best, had become an astronaut just like I hoped to do, and now he was dead. He'd been in the back seat of a T-38 jet while Elliot See, an astronaut I didn't know, flew the airplane. I had heard that Elliot was more of a stick-and-rudder kind of pilot: instruments were not so much his thing. In atrocious weather conditions, needing to land, he'd tried to circle under some clouds to visually line up with the runway and hit a building. NASA had now lost three astronauts to air crashes, including Ted Freeman, another guy I barely knew, also from Edwards, who had died in a T-38 jet accident in 1964.

It didn't change my mind about NASA, nor did it slow anything down that day. No one came in the room to make an announcement. Most of the guys there were test pilots and through experience had

come to accept this kind of thing as just something that happened. The feeling was “Yeah, another good guy’s gone.” It was very much a test pilot way of doing business. They didn’t stop the interviews, and the day went on.

When I came out of the interviews, I had no idea how I had done, or whether I had impressed anyone. Throughout the process, I had no sense of who was in, who was out, and how I was doing. I don’t recall talking to any other pilots about how they gauged their chances of selection. I was so focused on getting in myself that I didn’t feel like comparing notes. It was time to head back to Edwards, and wait for a phone call telling me if I was an astronaut or not. Even back in California, although I was friends with guys who had just been through the tests, we didn’t discuss it much. Perhaps because I had come to know them as an instructor rather than a member of the class, they saw me in a slightly different light. Our friendships weren’t deep enough for us to share those thoughts and hopes.

Having endured the exhaustive tests and interviews, I would have been really disappointed if I hadn’t been selected. But then again, I had to consider that NASA had started out looking at hundreds of pilots, and we had already been pared down to around fifty. I also had no idea how many astronauts they wanted to pick. I said to myself that if I didn’t get selected, then hey, that’s the breaks, man. I may have been just as good as the rest, but someone else might be ahead of me on one little category or another. At that point in the selection process, most of us were far ahead of the basic selection requirements, with much more than the minimum flying time or academic credentials, so it was going to be a tough choice for NASA.

The phone call from Deke Slayton, NASA’s director of Flight Crew Operations, came in early April of 1966. Deke didn’t waste time on pleasantries. He told me straight out, if I were still interested, that he’d like me to come and work for him in Houston, starting the next month. I knew, at that moment, that my wife would never forgive me if I accepted. Nevertheless, I said yes. I was now at the top of the heap when it came to pilots. The most exclusive club of all: I was an astronaut.



## CHAPTER 4 ASTRONAUT

*Houston.* When you think of NASA or astronauts, you probably think of Houston. But in reality the space center is well outside of town. To get there from downtown Houston, I would take the freeway southeast toward Galveston, then turn off and drive east. On that thirty-mile drive from Houston to NASA, I saw nothing but countryside, with fields full of oil wells. One of the roads that crossed my path went north to Clear Lake City, where it dead-ended. Along the way were a few businesses and restaurants, but no homes. Straight ahead were the space center, three hotels, a grocery store, and a couple of fast food places. That was all. If you make that journey today, it's wall-to-wall congestion all the way, with strip malls and cheap restaurants. But in 1966, NASA was in the middle of nowhere. I became an astronaut only a few short years after the center opened, so the area had not had time to develop. It was the center of the universe for NASA, but pretty much nowhere for everyone else except us and some isolated ranchers and shrimpers. While we'd often go into downtown Houston, we spent much more time in the little towns close to the bayous and lakes around the space center, such as Dickinson, Kemah, and El Lago.

Those of us coming from Edwards rented rooms in a motel out by the freeway, until we got our feet on the ground. Although we were all friends and all making the same giant career leap, I can't recall any conversations about our selection before we made the move from the desert. There were no big slaps on the back or late-night discussions. We just headed out individually to Texas. One of the guys found the motel and, after a few phone calls, the rest of us followed.

I guess I have always been this way: always a loner. Looking back now, I realize that running the farm from such an early age made me self-reliant and confident in my own abilities. This independence affected my dealings with my contemporaries, and I never grew socially close to them. I made friends with many of my fellow pilots, but we never became a band of brothers. This go-it-alone approach was a habit that had worked for me so far because it allowed me to go off in my own direction whenever I needed.

I like people. I am friendly to many, but I get close to few. And I never tried to be in a clique. In group endeavors—and NASA was always a group effort—I believed that my actions would speak for me much more than my network of friends. I watched my actions closely when at work and carried this attitude with me to Houston.

Nevertheless, I missed some guys from Edwards. Hank Hartsfield was one. A real whiz in academics and an equally gifted flyer, Hank could have been one of NASA's brightest stars during the Apollo era. But instead, for three years, he was stuck in the air force's MOL program, which never did fly. Eventually, he was transferred to NASA, but by then Hank had lost any chance of a moon mission. Timing, as they say, is everything. Hank had to wait until the shuttle was flying, at which time

he proved to be a huge asset to the space agency. But his disappointment with MOL made me doubly thankful I didn't take that route.

For those who did come to Houston from Edwards, our families stayed behind while we looked for permanent homes. I wanted to build a new house and contacted a developer in Nassau Bay, a pretty area across the street from the space center. At first, he drove me around and we looked at potential building sites right on the waterfront. But then he pointed to a tree with a mark on it eight feet up. That, he said, was the high-water mark from a recent hurricane. No thanks, I said, and asked to see sites two blocks from the shoreline, on higher ground. Even then, the builder had to sink concrete pillars deep into the soft clay to hold up the house.

I labored over house plans and shared my ideas with Pam. She wasn't keen; she worried about money. How could we afford something as extravagant as a custom-built home? I knew something that she didn't yet know, however: a perk going back to the original Mercury astronauts. Long before I came into the program, they had signed a contract with the Time-Life magazine company and Field Enterprises media group for the exclusive rights to personal stories and pictures. The reasoning was that this arrangement would keep the rest of the press from hounding astronauts and their families on their doorsteps. The original seven did very well out of that deal; the extra money from the stories allowed them to enjoy activities that they could not otherwise afford, such as boat and auto racing.

I was later told that there had been some debate within NASA and the White House about the ethics of such a deal. After all, the space program was taxpayer sponsored, and some argued that astronauts shouldn't be paid extra for sharing their lives with the press. When Kennedy became president, he even considered canceling the contract renewal. After some candid discussions, however, the contract survived.

The discussion ended long before I joined. I was still officially in the air force, on assignment to NASA, and only received my basic military pay, which was much less than the salaries of civilian astronauts who had exactly the same job. So, in my mind, the Time-Life contract was a good deal. As I also came to realize, we were often away from home for weeks, working long hours. Whether we liked it or not, we were astronauts twenty-four hours a day, seven days a week, and never really off duty from our job. We more than earned that extra payment. My portion of the money was much less than what was offered in earlier years, since many more astronauts now had to share the deal. However, it was still a considerable amount.

The Time-Life deal was my first realization that the earlier astronauts had developed some interesting business arrangements. As a test pilot, I had routinely risked my life for my country. My colleagues who did not come to NASA were beginning to head to Vietnam and combat. But readers were not interested in routine heroism. They were interested in the promised moon landing and the men who might fly there. I could hardly object to the interest, however unfair. I had a beautiful house because of it.

I did hear later that NASA had also been extremely concerned about some of the other business deals the first astronauts wanted to take. There was discussion about the original seven being offered free cars and free homes in the Houston area, which some of them had wanted to accept. But the rulemakers said no. The agency also kept a close and disapproving eye on anyone offering the astronauts low-interest loans for houses.

Despite Pam's worries about the cost of our new home, the developer went ahead and built a three-bedroom Western-style ranch house for us, with a separate garage. With white bricks and an arched front entrance, it looked very Mexican. Until the developer finished the house, we had to live in rented accommodations. It was nice when my family could finally move in. Surrounded by huge oak



trees, our home was close—but not too close—to the water. In fact, after we finally sold that house, at least three other shuttle-era astronaut families lived in it.

It turned out that two other recently selected astronauts, Joe Engle and Owen Garriott, were also building homes on the same quiet cul-de-sac. I was glad to have them as neighbors. Owen ended up right next door, with Joe next to him. As the entire street was only about five hundred feet long, most of it was taken up by our three homes, facing each other in a semicircle.

My daughter Alison quickly made friends with Owen's five-year-old son, Richard. They grew up together, and I would see him running around the neighborhood with her every day. It was, therefore, a proud but surreal moment when, more than forty years later, I watched Richard on TV, floating around inside the International Space Station. That little kid became a space traveler, too.

Finally, I was giving my family a permanent home and some security. We'd no longer move every year to a new city. But some things never changed. My job was just as dangerous and occupied all of my time. Would a new home, secure job, and extra money be enough to ease the tensions in my marriage? I didn't know what else to do but hope, as I plunged into my new career.

The space center itself, just a short drive from home, was a collection of spartan but functional buildings. My first view of it was nothing like my first look at West Point; this place was not designed to impress anyone. In addition to office suites, mission control, and testing facilities, NASA had constructed an office building for the astronauts, the trainers, and equipment managers; a cafeteria across the parking lot; a simulator building to the side; and a medical building at the back. It was nothing fancy. On my first day I showed up at the security office, received my ID badge, and attended a briefing in the astronaut office auditorium. They issued the new astronauts schedules, told us what NASA generally expected of us, assigned us to offices, and instructed us to show up the next morning. The orientation was brief and to the point. Nobody seemed to care too much. We were just *there*.

I was assigned to a sparse-looking office with a linoleum floor, a window, and two desks, which I'd be sharing with another new astronaut. But we were rarely there. We were always in meetings, working on programs, or making trips to some facility or another. Work, it seemed, was done everywhere else but in the office.

The first person sharing that small office with me had a sense of humor matched by few others at NASA. I had not known Paul "PJ" Weitz before we were selected, so at first I was a little wary of sharing an office with a stranger. I needn't have worried. He kept me laughing the whole time and became one of my closest friends in those early years at NASA. I still look forward to spending time with PJ whenever I can.

Pilots' meetings are much the same all over the world. Our weekly gatherings felt like familiar territory, as if I were back at Edwards. Directed by Deke Slayton, a former Edwards test pilot himself, they were designed to update us on the status of the current programs. The astronauts who had been on the job for a while talked about what they had done, updated everybody on issues related to the various projects they worked on, and shared problems or concerns. Deke also handed out assignments: who would do what and where for the next week. He told us anything that we needed to be aware of when flying jets, such as new rules, regulations, and restrictions.

Slayton and the air force had very different approaches, however, to personal responsibility. When the group discussed something that a fellow astronaut had done wrong, especially when flying a jet, many embarrassing incidents were dealt with there and then and discussed nowhere else. There were dangerous moments in the air that were allowed to slide by because the astronaut office was a self-protecting fraternity.

I remember one guy—his name is not important, he's just an example—who destroyed a Bell H-13

helicopter. He was heading back to Houston on a Sunday night after spending the weekend at a hunting ranch. He wasn't even wearing a flight suit; he was still in his cowboy clothes, with a rifle and all his hunting gear in the cockpit, already a dumb situation. Then it got worse. This supposed hotshot test pilot, at the top of his game, ran out of gas just south of the airport. He crashed the helicopter into a fence surrounding an open field, walked away, and nothing was ever said about it except in the weekly meeting. If he'd still been with an air force squadron, he would have been in deep trouble. As far as I know, NASA never reprimanded him. This kind of attitude didn't help me feel protected. If anything, it scared me.

At first, we new guys were clearly considered apprentices, not yet part of the group. When I joined the program, I thought, "Oh, man, this is great. I am now an astronaut." It didn't take me long to figure out that I wasn't. The pilots who were already in the program didn't really look on us as astronauts until we'd made a spaceflight.

I felt a little like a West Point plebe again, or a novice back at Moore Air Base. I was at the bottom and had to work my way up. The feeling was nothing new: it happened every time I started in a new direction or made a new step in my career.

My sense of being the "new kid" was particularly strong around the original seven astronauts, who had been selected back in 1959. By the time I joined the astronaut corps, six remained with NASA, and only four were on flight status. John Glenn, the first American to orbit Earth, had left in 1964. I also never really got to know Scott Carpenter, who flew the next mission after Glenn, since he left within my first year. The other five, however—Slayton, Shepard, Grissom, Schirra, and Cooper—were kings of the hill. A mystique surrounded them, which they happily cultivated. In their minds, we new guys hadn't yet proved ourselves. That was fine by me, because it was true: we hadn't.

This mystique, I learned, extended to generous car dealers. Many of the astronauts were friends with Jim Rathmann, a fun guy who had a Chevrolet dealership just down the coast from Cape Canaveral, Florida, where NASA launched its rockets. Jim, in turn, was a close friend of Ed Cole, the president of General Motors. Rathmann acted as the go-between for the astronauts and General Motors, leasing cars to us. General Motors would send the cars to Jim, he'd lease them to us on a six-month basis for a small amount, and at the end of the six months we'd turn them back in and get another one. General Motors would take the cars back and resell them as astronaut-driven vehicles. They didn't lose any money, and it didn't hurt their image for the astronauts to be seen driving shiny new Corvettes. It was smart business sense, and Ed and Jim also did it out of admiration and respect for the spacefarers.

I assumed the deal had also been okayed with the NASA administrators, or that they had decided it was out of their control. To be honest, I am not sure. I know that the first astronauts organized it back in the early days. Was there any official resistance behind the scenes? I don't know. Certainly by the time I showed up, no one officially seemed to care about it.

My reaction, naturally, was to ask one of the original astronauts how I could also get a Corvette. He slapped me down so fast it shocked me. "You new guys won't be part of that," he barked at me. "You don't deserve that." I got the point: I was being put in my place and reminded that I didn't yet count for jack. I later became friendly with this guy, eventually talked about the deal again, and discovered that General Motors didn't restrict their offer to certain astronauts. This guy had no power over the choice. Yet, in my first few months on the job, I wasn't supposed to know that.

Deke assigned all of us new guys to one of the more senior spacefarers while we found our feet and our place in the program. It was a good arrangement. He assigned me to Wally Schirra, a respected former navy test pilot who had commanded both Mercury and Gemini space missions,

including the first-ever space rendezvous. As I shook his hand, Schirra looked me right in the eye. “You know, Worden,” he told me sternly, “you’ve got to understand something from the start. You don’t count for anything around here.”

I knew he was testing me. I remembered a flippant saying from West Point that the only people whom the students outranked were the superintendent’s pet cat and anyone serving in the navy. Taking a risk, I stared right back at him and said, “Sir, I realize I am only a captain in the air force, but I know for sure that I outrank a captain in the navy.”

Schirra paused for a split second, and I wondered if I had made a terrible mistake. Then he broke into a loud, booming laugh and clapped me on the shoulder. “You don’t have to report to me?” he continued. “Screw that—go and get me a cup of coffee!” I’d had my first experience with Wally the prankster; he never took himself too seriously. From then on we were great friends.

I was one of nineteen guys chosen for the fifth astronaut group, the largest ever selected at the time. NASA had told Deke Slayton that the forthcoming Apollo program could result in dozens of flights and that he should select enough people to fly them. He, therefore, took everyone he felt was qualified from the top group of finalists. It’s no wonder that some of the older astronauts didn’t warmly welcome us, and in fact resented us showing up. Once you were in the program, Deke often said, you were as qualified to fly into space as anyone else already there. More competition for seats meant fewer flights for the older guys, and for at least the first year they kept us a little isolated from the rest of the team.

NASA’s confident prediction of dozens of Apollo flights was wrong: eventually the budget was slashed, flights were canceled, and money siphoned into the development of the space shuttle. Some of the guys in my group had to wait two decades before their first flight into space. That’s a hell of a long time to wait until you are allowed to do the job you trained for, and I doubt I would have waited that long.

Amongst the nineteen were pilots I knew well from Edwards. Charlie Duke, Ken Mattingly, Stu Roosa, and Ed Mitchell had all been at the Aerospace Research Pilot School with me. Fred Haise had attended, too, although he had left to do other test pilot work by the time I arrived. While at Edwards, we used to have parties at Stu Roosa’s house every weekend, some of the craziest drunken parties I have ever been to. We’d wake up in the morning, find that we’d set fire to objects on his front lawn, and have no memory of doing so. The five of us already knew each other well, and our camaraderie continued when we moved to Houston. We socialized for a while before we were absorbed into the wider program, and we were bad boys—really bad. In the end, all of us flew to the moon during the Apollo program.

Then there was Joe Engle. He’d been at Edwards, too, but I didn’t know him too well because he’d been off flying the X-15 rocket plane. Unlike most of us, Joe already knew all of the senior astronauts before he arrived in Houston. He had even flown in space before he became a NASA astronaut. As an X-15 pilot, he’d taken that rocket plane higher than fifty miles three times, each considered a suborbital spaceflight by air force definitions, and had earned air force astronaut wings.

Joe Engle is the best formation pilot I have ever seen. He’d chosen a different career specialty than me, flying in close combat formation in a tactical fighter squadron. He could do a tight barrel roll around me from one wing to another, and then gently drop right back into position right off my wingtip. The first time he performed that maneuver with me, on a flight out to Edwards, I was in awe—I had no idea airplanes could *do* that.

By far the most experienced aviator in our group, Joe was kind of the big man on campus. When he narrowly missed out on flying during Apollo, many people were surprised. He served on an Apollo

backup crew, but then had to wait until a space shuttle flight in 1981. It went to show, no one could assume anything when it came to getting a spaceflight assignment.

In the end, fewer than half of my group would fly to the moon. Most of the others trained to fly there, but budget cuts meant that they would fly in later programs instead. In addition to my Edwards friends, fellow group members Ron Evans, Jim Irwin, and Jack Swigert made it onto missions to the moon. PJ Weitz, Jack Lousma, Jerry Carr, and Bill Pogue missed out on lunar flights but did fly to the Skylab space station. Pogue was the officer who had greeted me when I arrived in England a few years before, and I knew by reputation that he was an exceptional pilot.

Vance Brand ended up with a seat on the last Apollo mission in 1975, Apollo-Soyuz, the first joint mission with the Russians. Others had to wait even longer. Along with Joe Engle, both Bruce McCandless and Don Lind did not make their first flights until the space shuttle was operating. Don ended up flying his first, and only, mission in 1985, a full nineteen years after he became an astronaut.

I guess, for some, the lure of flying in space kept them in the program for so long. Many of my group of nineteen stuck around for a long time even after making a first flight. Fred Haise did some shuttle test flying. Ken Mattingly, PJ Weitz, and Jack Lousma all stayed to fly the shuttle into orbit. And Vance Brand flew until 1990, making his fourth spaceflight that year. In fact, until his retirement in early 2008, he still worked for NASA, albeit in a management role. He was the last of our group still on the roster.

Two of my group never had the chance to fly in space. John Bull was quiet and modest, yet highly skilled. He had been a navy test pilot before joining the program. I believe Deke considered him one of the top guys in our group. However, in 1968 the doctors discovered that he had a rare pulmonary medical condition. He had to leave the astronaut corps, and there was also no place for him back in the navy. He found a job as a flight test researcher at NASA's Ames Research Center in California. Years later, when I had to leave the astronaut group and wound up at Ames as well, John was still there. It was a strange irony.

The other person in my group who never flew was a very talented air force test pilot named Ed Givens. When NASA picked him, he was working on a backpack that astronauts could use to maneuver during spacewalks. Ed was an interesting guy, but he was dead and gone before any of us got to know him. He died in an automobile accident near Houston a little more than a year after our group arrived. Because he was killed in a car instead of an airplane or spacecraft, he is perhaps the least remembered of the astronauts who died while in the program, which is a damn shame. He deserved better.

Overall, our group did well to get as many flights as we did. We'd been picked in the general hope that, after the first lunar landing, the purse strings would open and we'd keep flying there for a long time. I fully expected to make a couple of flights and to command a landing on the moon.

Once we arrived in Houston, it didn't mean much that we had been selected as a group. We were pretty much on our own, and it was every man for himself. And some of those pilots saw this situation as a competition: a race to get selected for the best missions. Considering we were looked on as the new guys with everything to prove, that attitude was understandable.

However, that was not my style. I figured if I did the best job I could and didn't worry about the office politics, senior management would reward me. It isn't part of my personality to play politics. I don't think I could do it if I tried.

It could be that the senior astronauts found me more acceptable because I'd been a test pilot instructor, but I also didn't play any games to make friends. I did my best, and that effort seemed to elevate me to a position of respect, far more than any office politics ever could. The experienced

astronauts accepted me quickly because they learned they could rely on me to do the job well. Competence was a qualification expected by those who might fly in space with you one day. They preferred to return alive.

Not everybody in my group took that route. Some guys tried to play the favorites game. They identified Alan Shepard and Deke Slayton as the two bosses to impress. Both were members of the original group of seven astronauts and both were temporarily grounded by medical conditions. Deke Slayton was the director of Flight Crew Operations, and his primary job was to select astronauts and assign them to flights. Working under him was the chief of the astronaut office, Alan Shepard, the first American to fly into space. My colleagues believed that these two made all of the important crew selection decisions. However, Deke and Al both held their cards close to their chests. Those looking for clues about how to impress them and make a spaceflight had little to go on.

I liked Deke a lot and thought he did a superb job. Even though people all around him gossiped about how to get on a flight, whom to impress, whom to flatter, Deke stayed above it all and played things straight. He'd select new groups of astronauts, put them through a training program, and then ask them to privately rate each other. Using that list, and his own observations, he'd assign people to missions. There was nothing magic about it; Deke was a straight guy—gruff, no-nonsense—but fair. He didn't play games.

There was one pilot in my group who thought he could influence Deke by relentlessly sucking up to him, even taking on his favorite social pastimes. Deke seemed to enjoy his friendship, and they'd go off on hunting trips together, but when it came time to assign astronauts to missions, this guy didn't fly in Apollo. I heard he hadn't been training hard enough. With dozens of ambitious astronauts looking to impress him, I admired Deke for his unwavering professionalism. In the end, the astronauts with talent who didn't make a big deal out of it did better than those who tried to suck up to the boss.

Al Shepard may have officially been named the chief of the astronaut office, but he was never there. Shepard had many outside business interests. He'd come to work in the morning for an hour or two, then he'd take off to do non-NASA business, and we wouldn't see him again. He worked his way into being a millionaire, and it seemed to happen on government time, which was supposed to be against the rules. Yet I don't think anyone ever dared question Al because of his stature at NASA. He was the first American in space and, as such, was immune to scolding.

He wasn't the only astronaut with outside interests who skated through his NASA years without a reprimand. One astronaut was on the board of a bank when a review board slammed them for incorrect banking practices. It blew up into a huge scandal in the press, especially since the whole affair involved some of the same people who had offered the original astronauts free homes. Luckily for that astronaut, his name was generally kept out of the papers—and I won't repeat it here. It was a good lesson for all of us: sitting on a board of directors was lucrative, but we ran the risk that our names and reputations might be used for shady business practices.

Al Shepard, however, managed to avoid public scandal. Al looked after Al. It was that simple. Officially, he managed the astronaut office. If some other astronaut had a flying mishap, he'd go take a look, and maybe admonish the pilot. Other than that, I don't know what Al did, because he was never there and was not really a boss. Deke made all the flight assignments and really decided what happened. Years later, when we were both out of the program, I often worked with Al on charity events, and we became much friendlier. But when I began at NASA, I thought Al Shepard was a real jerk.

Whatever the office politics, none of my group would fly in space for a while. First, we had to train. We spent most of our first year in classes, designed to teach us the basics of orbital mechanics,

trajectories, rendezvous, docking, and other skills. The trouble was, our teachers were giving us only the practical user information about how the spacecraft and rocket parts worked. We were learning how to operate equipment, but there was no discussion of the theories or engineering behind them. As Jack Lousma said at the time, it was like reading the manual for a new car so you can learn *how* it works. You would never learn *why* it worked that way. It felt like we were only receiving half of the training.

After about a week of study, Ed Mitchell, Charlie Duke, and I got together to talk. The three of us had been through the intense courses at Edwards, and I had even taught some of them. We agreed that we could teach these subjects better.

It was a little gutsy for three brand-new guys to track down Al Shepard and tell him, “We know more than our instructors. Let us teach these courses instead.” Yet Shepard had no objections, and we were soon leading the classes. Jack Lousma jumped in, too, and taught the physics of rocket propulsion, which had been his specialty in graduate school.

As I also got to know other astronauts from the earlier groups, I became particularly good friends with C.C. Williams. A marine corps test pilot and real top-notch guy, C.C. wasn’t a blowhard like some of the others; he just humbly did his job. I got to know him, his wife, Beth, and his daughter well, and used to borrow his truck whenever I needed to move something heavy, such as gravel, for my yard.

Mike Collins, whom I already admired from his piloting at Edwards, became my role model and my hero. He still is. Mike was not only very smart, but also aware and astute in ways that the rest of us never quite attained. I was also a little jealous that Mike had made it into the program earlier than me. I didn’t care that the earlier spacecraft were more primitive. Pilots like Mike, chosen for the third group of astronauts, flew some amazing missions.

I would have given anything to be one of the original seven astronauts, because they ruled the roost. The second group of astronauts selected by NASA, however, was even more experienced and impressive. By then, NASA was homing in more specifically on the kind of pilots they needed and brought in people like Frank Borman, Pete Conrad, and Tom Stafford, some of the best pilots I’d ever seen.

Stafford was a renowned test pilot whose exploits were part of the legends of Edwards. Aviators there, using their most impressive pilot-talk, described an incident when Stafford was making only his third flight in the YT-38A jet. He entered the air base’s traffic pattern landing sequence and was turning from downwind onto the base leg at approximately one thousand feet, which is at right angles to the runway. At that moment, the aircraft’s flap interconnect drive mechanism failed and exploded through the bottom of the fuselage. The YT-38A rolled dangerously until the wings were vertical. Stafford threw full opposite aileron control against the roll, but the jet continued to slowly roll past vertical toward an inverted position. So he immediately kicked in full top rudder and slammed on both afterburners. The aircraft skidded back to level flight about two hundred feet above the runway. He then retracted the one working flap and worked the aircraft back level for a successful high-speed landing. All of this happened in a few seconds. Damn, I thought, that was quick thinking. When I arrived at NASA, my first thought when I saw guys like Tom was, “Wow, there’s the guy who made that incredible maneuver I heard about.”

The second group of NASA astronauts flew the most, both in the Gemini program and commanding missions to the moon. They entered the line at the right time and flew as much as they wanted to. All I got to do during the Gemini program was watch a launch. NASA was wrapping up that program by the time they selected me, and the liftoff I saw was one of the last. It was also the first manned launch

I had ever seen in person, and I was thrilled, thinking “Hey, there go a couple of guys I know, and, God willing, I’m going to make the same trip some day.”

I wasn’t just getting to know my fellow astronauts in the workplace; we also did fun things together on weekends. Some were activities that NASA didn’t always look kindly upon, but they had little control over our personal time. As long as we didn’t embarrass NASA, we were given the freedom to do what we wanted. I found out that two of the original seven astronauts, Gus Grissom and Gordo Cooper, were racing-car enthusiasts. They teamed up with Jim Rathmann to enter two cars in the Indianapolis 500 race, under the team name of GRC—Grissom Rathmann Cooper. After tinkering with cars so much as a teen, I was naturally intrigued by the speed and power of these race cars. I volunteered to work for the team’s pit crew.

It was fun to be back working on cars, although we did not have much luck in the competition. Our main problem: we had a driver and car that couldn’t stay on the track. The first day testing the carburetor, our driver took the car out of the pit row and drove it straight into a wall. We had to drag the car back to the pit, tear it apart, x-ray all of the parts to check for cracks and bends, repair the chassis, and put it all back together again for the next day. That process took all day and all night. The next day, that driver started the engine and drove the car right into the wall again. After that, we gave up. We had been awake for almost forty-eight hours, and enough was enough.

Most astronauts had some kind of outside interests while they were in the program, and many were in the business world. My interests never went in that direction; instead, I was engrossed with car racing. Eventually, Rathmann put together a Sports Car Club of America team. We had three Formula Vee cars, which we took to racetracks in Florida. The open-cockpit vehicles looked just like Formula One racers, but they were much smaller and powered by 1200cc Volkswagen engines. It was a fun weekend activity, and I was joined by fellow astronaut Pete Conrad.

Pete was great fun to be around; he had an endless stream of jokes and stories to tell. Somehow he managed to be the center of attention wherever he went and was always laughing about something. He was a tiny little guy, but it made no difference. He commanded attention as if he were seven feet tall. Pete was already one of the exalted few who had flown two space missions, and he ended up flying four. He flew his first with Gordo Cooper, who probably got him into racing. Together with Gus Grissom, we were the four astronauts who raced sports cars.

Like Pete, Jim Rathmann was fun: one of the world’s great practical jokers. He owned a large trailer that could transport three race cars, and we would head out to a racetrack, stay there Friday and Saturday nights, and race Saturday and Sunday. The Sports Car Club of America was a fun organization, full of great people who would all help each other. There was always a lively fireside party on Saturday nights. As it was a weekend activity, it didn’t really affect anybody when it came to work. We did, however, take a slight gamble on getting injured in a crash, but considered it a low probability.

I don’t ever recall asking NASA for permission to race cars, but I don’t think I kept it a secret either. It was just something I did when I had the free time. Everyone knew that the four of us raced, and neither Deke nor Al ever said anything to me. The feeling was that we were all big boys, and while racing was not against the rules, they expected us to be careful.



*Racing cars became a new passion of mine.*

Later on, when I was assigned to a backup crew for a space mission, Deke did tell me, “Don’t do anything that will take you out. Don’t hurt yourself. When you get to a point where you think you are doing something too dangerous, then get out of it.” He was right: it was more important to stay healthy and on a crew than to have fun on weekends.

Perhaps I should have listened earlier; I finally did have an accident at a racetrack. There was a driver we used to race against all the time who also worked as an undertaker. He would come to all the events with his race car inside the back of a hearse. He had a hard time staying away from other cars on the track and had bumped or wrecked a car in each of his last three races. We all hoped we wouldn’t be the next driver he’d crash into. The morning of one race he came up to me and said, “Al, I have a feeling that today is your day.” That was an ominous thing to hear, but I decided to race anyway.

The track was an old World War II runway, which had been surfaced with a mix of asphalt and seashells. Over the years the seashells had worked loose, and they formed a loose, slippery coating on the top of the track. If you stayed on the main track it wasn’t too slippery, but toward the edges it was easy to skid. As the undertaker and I came around the first turn together, he went wide and started rotating as he slid on the shells. Yet he never took his foot off the gas. As soon as his car gained traction again, he shot across the track, right at me. There was nothing I could do. With a loud crunch he slammed right into the back of my car and almost tore the end off.

Although I escaped injury, the danger was clear. If I kept racing I might lose my chance to fly in space. Nothing was worth taking that risk, so with regret I sold my car and quit the sport altogether. Although I believe Pete Conrad continued to race a little longer, the team soon broke up.

Gordo Cooper wasn’t so lucky. He was one of my best friends by then, but I also knew he was bad news. He taunted authority. Deke pulled him out of a race at the Daytona racetrack, insisting that Gordo focus on spacecraft checkout work. Gordo had always pushed the rules a little, and this edict annoyed him no end. I think it had a lot to do with his leaving NASA altogether; he and the agency never recovered their faith in each other.



Car racing wasn't my only leisure pastime. I played handball with Mike Collins, raced speedboats, and also found time to water-ski. My home was only a short stroll away from a little bay that opened onto Clear Lake, and I water-skied down there almost every weekend to relieve tension and forget about work.

Many people assumed that astronauts needed to be in top physical condition, and that NASA had some kind of exercise plan we all had to follow. Not true. Our bosses believed we were grown-ups who knew we had to stay in shape, and they allowed us to follow our individual sports and exercise pursuits. Ironically, we had some pretty unhealthy habits. For example, just about everybody smoked back then. It was not frowned on like it is today.

I'm still smoking today. In fact I am probably the only person in the whole goddamn program who hasn't given it up. I have managed to kick the habit for a couple of years at a time, but never completely. I smoked all the way through NASA, and so did almost everybody I ever shared an office with. If I could have worked out how to do it safely, I'd have smoked all the way to the moon and back.

To keep up the waterskiing, I eventually bought a boat with one of the instructor pilots for NASA's airplanes out at nearby Ellington Field. Another astronaut named Walt Cunningham soon joined us. Walt and I also began playing handball two or three times a week, and we became very competitive, which really kept me on my toes. The Ellington instructor who joined us was competitive, too, but in a way that eventually took a dark turn.

This guy was always jealous of the various perks that we received as astronauts. He could never understand why he wasn't included in deals such as the Corvette leases. After all, he was one of our instructors, so he believed that he must be better than, or at least equal to us, and deserved any astronaut perks. Sadly, behind our backs, he turned to illegal activity to keep up with our lifestyles.

He started flying an airplane to help smuggle marijuana across the Mexican border. Eventually, of course, he was caught and sent to jail. Because of his jealousy, he lost everything. Ironically, he would have made a great astronaut. He was a talented pilot and very bright. Yet he wasn't smart enough to see that smuggling wasn't the way to make money and keep pace with us. It was a sad situation: a guy rubbing shoulders with NASA's astronauts one day and the next day frozen out forever. We had to forget about him and move on with our careers.

Academic classes and weekend activities weren't the only things we new guys were doing in our early years at NASA. When it fit around other activities, we did survival training. A spacecraft might have to come down almost anywhere on Earth in an emergency. We could spend days, or even weeks, on our own before help came, with only the items in our spacecraft for survival. Rather than carry out this training all in one go, we did it whenever there was time, often with months between sessions.

NASA left us in the large, arid deserts of eastern Washington State for around five days, giving us spacecraft parachutes and a basic survival kit, but not much else. Working in groups of three just like an Apollo crew, we'd make tents and clothes out of the parachutes, and construct solar stills to collect water. More exciting, however, was when they sent us down to the air force's survival school in the jungles of Panama.

In the classroom for our initial briefing, I surveyed the room. Dozens of stuffed animal heads were mounted on the walls. Studying the decorations a little closer, I spotted something odd: some of them were moving. Each one had a live boa constrictor wrapped around it. This training would be quite an experience. The day grew even odder when the instructors grabbed one of the boas, then skinned and cooked it. This, we were told, was our lunch.

After some classes on edible jungle plants and animals, a helicopter dropped us off in the rain

forest with some air force survival instructors, and we set up camp for a couple of days. The jungle turned out to be quite different from my expectations. A real jungle doesn't have any undergrowth, because little sunlight makes it through the thick tree canopy. The trees were nearly a hundred feet tall, and we could see for more than half a mile under them.

Once again, we only had the same equipment stowed on an Apollo spacecraft. We made hammocks, slung between two trees to keep us off the wet ground. Not surprisingly for a rain forest, it rained on us a lot, which made conditions pretty miserable. Soon we all stripped down to our long johns; we must have looked pretty amusing. We ate emergency rations and monkeypod tree seed pods, which had a sweet edible pulp.

On the last day, we broke camp and trudged down a path to the nearby river. On the way, one of our instructors showed us how to milk the venom from a fer-de-lance snake, which is an extremely venomous creature. Lord knows what he was thinking, but Bruce McCandless then grabbed the snake and stuffed it in a burlap sack.

We put on life preservers, jumped into rafts and floated downstream to a Chocó Indian village, with Bruce still holding his bag. The Chocó put on a grand welcome. We made our way up through the bamboo houses to the chief's hut. Four live iguanas, their legs tied behind them so they couldn't move, lay in a corner. Guess what we had for lunch? The roast iguana was actually very good; it tasted exactly like chicken. The meal was better than I thought it would be, and a suitable feast to end our time in Panama. The survival practice was a learning experience we hoped we'd never have to carry out for real. Nevertheless, it was a lot of fun, an escape from the technical work we did back in the States.

Bruce brought his snake all the way back to Houston, where he donated it to the zoo. But first, he had to get it through the customs and agriculture inspection. The customs officer, not keen on dealing with a venomous creature, asked his supervisor across the room to make the inspection. Looking in his rule book, the supervisor found out that the regulations required a "visual inspection for external parasites." Staying far on the other side of the room, he warily eyed the snake for a moment, then called out, "Looks good to me from here!" And so Bruce's snake became a U.S. citizen.

I received my first real assignment at NASA that first year. With the Gemini program at an end by late 1966, NASA was gearing up to fly the first Apollo missions. The plan was to land on the moon by the end of the decade, and the clock was ticking. NASA would first fly a simpler version of the Apollo command module spacecraft known as Block I, before progressing to more complex missions with a more sophisticated version, Block II. The program was trying to hustle; NASA pushed ahead without waiting for Block II to be ready for all missions. I was assigned to work in Downey, just south of Los Angeles, where North American Aviation was building the Apollo command module. I was already familiar with their work; I'd been flying the airplanes they built for years.

The assignment quickly grew into something even more important. Ed Mitchell, Fred Haise, and I became the first of our group to be assigned to help with a mission. Each Apollo flight had a prime crew of three astronauts who flew the mission and a backup crew who were ready to fly if the prime crew could not. Then there was the support crew: three more astronauts assigned to help with any other jobs the prime and backup crews didn't have time for. In November, the three of us were named as the support team for the second manned Apollo flight. It wasn't a seat on a space mission—not yet—but it was the beginning of working into a system that could place me on a backup and then a prime crew. To get a foot in the door this early in the Apollo program meant that I must have been doing something right. I saw this posting as a sign that my bosses, especially Deke, were happy with me.

It made sense to assign a test pilot with an engineering background to this job. Even though every

Apollo flight was, in a sense, a test flight, the plan wasn't to go up into orbit and only then find out how a spacecraft performed. Instead, astronauts would fly in space the way they had been trained in simulations on the ground: the way the flight plan told them to. The procedures in each flight plan would be well defined, and created through careful engineering analysis and testing. We had to know exactly what each spacecraft would do long before we sent it up. That would be my job: as part of a team, to thoroughly test the Apollo command module while it was built.

My test pilot experience proved useful, because it gave me the right mental attitude to do the job. We were in new territory, flying a vehicle that no one had ever piloted before. However, my engineering background was even more important, because it allowed me to understand the spacecraft's fiendishly complicated systems.



*Training inside the Apollo command module*

Unlike the cramped Mercury and Gemini spacecraft, the Apollo command module was a spacious Cadillac. Yet it was still pretty small for three people. If you want to get a general idea of what it was like to be inside, climb into a Volkswagen Beetle with two of your buddies, lock the doors, and don't come out for two weeks.

The command module was just one of three spacecraft sections making up the entire Apollo assembly that would fly to the moon. Behind the command module was the service module, also manufactured by North American, which carried all of the electricity, water, oxygen, propulsion and communication equipment for the flight. It was a little like hauling a big trailer behind your car, with all the supplies you need for a long trip but don't wish to bring back home. It also had all of the little

thrusters for small maneuvers, and a big engine on the back for large maneuvers such as heading back to Earth from lunar orbit.

Then there was the lunar module, designed specifically to operate on and around the moon. It was built using the most lightweight materials possible. If you imagine a helicopter without rotor blades or a tail, balanced on a jet engine that pointed down, it will give you a general idea of this odd flying machine. The lunar module was something I would like to have flown—it would have been a kick—but it was built by a different company, Grumman, way over on the East Coast, so I didn't have much to do with it. I never worked directly on the Block I command module either, only Block II. Before the first generation of Apollo spacecraft had even flown, I was working on the next generation.

To get to Downey and other places around the country, we flew ourselves in Northrop T-38 Talon jets. They were, in effect, our personal vehicles. Not only did they get us around much faster than commercial travel, they also kept our piloting skills sharp. We had about the same number of T-38s as astronauts; I could almost have put my name on one of them. It was the greatest transportation in the world. The agency placed a lot of trust in us. There was an urgency to what we did, so it didn't seem unusual that we flew ourselves around the country like this. Everyone at NASA wanted us to be in the right place at the right time so that the program could keep moving. One phone call got me an airplane in an hour, ready to go. I'd drive out to the airfield, put my bag between the two seats, and head skyward.

We were a competitive group, of course, so a lot of these cross-country flights turned into races. I recall leaving Houston at the same time as the Continental nonstop flight to Los Angeles. Just for kicks I hot-rodged it to El Paso, Texas, refueled, headed back up to the best altitude as fast as I could, and beat that LA flight. To save time I had to hot-refuel: that is, pump gas with the engines still running. We weren't supposed to do this with our airplanes, but every astronaut did it, and it saved a few precious seconds.

It was wonderful flying performed by a bunch of elite aviators. Yes, some of the astronauts made piloting mistakes here and there. But overall my colleagues were all extremely skilled, knew exactly what they were doing, what risks to take, and what not to do. Every now and then we may have pushed it a little—such as pressing on to Houston even if the weather was bad there—but we knew how to handle those conditions and were comfortable in the air.



*Flying the T-38 jet, our main form of transport*

Unless, of course, we had partied too much the night before.

Very early in my tenure at NASA, I was working at the Cape on the same night as a big Gemini postflight party. One of the Gemini astronauts had a little too much to drink, decided he could fly without a spacecraft—and prepared to jump from the third-floor balcony of the Holiday Inn. His colleagues locked him in a closet for the rest of the night so he couldn't hurt himself. Guess who had to fly with him to Downey the next morning?

We set off in two separate aircraft; I piloted a T-38, while he flew my wing in a T-33 Shooting Star jet. At least, he tried. We began in close formation, but soon he wandered off about a mile before drifting back to my side. He kept this up all the way to Houston, where we landed and left the T-33. He headed home to change his clothes while I stayed at the airport with the T-38. When he reappeared I told him, "Get in the back seat. I'm not letting you fly today. You had *way* too much to drink last night." He didn't object. In fact, he looked relieved and climbed in behind me.

Up at high altitude on the way to California, I grew a little concerned: I hadn't heard from him for about an hour, "Hey," I asked on the radio, "are you okay back there?" No response. I looked in the mirror on the canopy rail above the windshield. His head was bowed. Wonderful—it looked like my copilot fell asleep. I concentrated on my flying once more.

Then I felt a sharp jolt on my control stick, and the jet shuddered. What the hell? Had we hit something? No, we were flying fine. After working through any possible problems with the aircraft, I could only conclude that my sleeping copilot had bumped his control stick.

We flew on to a smooth landing in Los Angeles and climbed out of the jet. I was ready to ask him about the stick, but as soon as I saw his face I didn't need to. One of his eyes was bright red, no white visible. He'd fallen asleep so soundly that his head had forcefully slumped right onto his control stick. I was surprised he hadn't dislodged his eye. The guy walked around for weeks afterward with a gruesome red eye, while his bosses pretended not to notice.

Fortunately, dumb behavior like this was pretty rare. I flew to Los Angeles for my work at Downey

so often, the fifteen-hundred-mile journey became like a bus ride for me. I'd leave Houston, stop in El Paso to refuel, and head on to California. At El Paso, I'd open the canopy and the Mexican flight line chief would hand me an enchilada to munch on while I waited.

I soon had a new work routine: I would leave Ellington Field at dusk on Sunday and land at Los Angeles airport. I'd park the airplane at the North American Aviation ramp on the south side of the field; a rental car would be waiting for me. Some astronauts, not content just to race airplanes, also raced their rental cars from the airport over to Downey. I would throw my gear in the back, drive east down the highway to Downey, and arrive at a hotel around nine o'clock, local time. That left me enough time to get some sleep and go to work early the next morning.

On Friday night, I'd head back to the airport and fly home. If I were very careful how I flew, and if the winds were right, I could sometimes make it all the way back from LA to Houston without refueling. When attempting that nonstop flight, I couldn't perform a normal takeoff using my afterburner. I had to begin my journey without it and use a lot more runway, then get high enough to catch the wind.

A couple of times, I got pretty low on fuel. It was a surreal feeling: my world contracted to that tiny fuel gauge needle, as I calculated and recalculated how much time I had left, and if it was enough to get me to Ellington. The worst thing I could have done would be to eject from an airplane because I hadn't figured my fuel right. I would lose an expensive government airplane for no good reason, possibly ruin my career—and feel like a dumb shit for the rest of my life.

The hairiest moments were when the weather was bad at Ellington, but I would have no choice when I was low on fuel—it was the closest airfield. It didn't matter how strong the wind was blowing, it was my only hope. Locking on to Ellington's radio guidance beacon, I flew through thick clouds, unable to see a thing. Right next to the runway, somewhere in the murk, was a huge water tower, and if my approach were off by a fraction I could plow right into it. If my instruments weren't calibrated correctly, I might make a direct hit. Each T-38, in theory identical, had its own little quirks, and we flew so many that we never had time to get a feel for them all. Today might be the day I found this one had a defect.

Scared as shit, I would hope like hell my engines didn't flame out, focus on my instruments, and finally break out of the bottom of the cloud only seventy-five feet above the ground. I would be level with the water tower and only three seconds from landing when I'd finally catch my first, blessed glimpse of the welcoming lights of the runway. I'd be ready to veer over if necessary, but luckily the lights would be right below me. My instruments were fine. I would taxi down the runway, open the canopy, and take my first deep breath in a long time. I am alive, I would exult, and life is great!

The next thing to do after such a landing is to bury your feelings deeply. As I walked into the hangar, if anyone had asked me about a landing with low fuel in bad weather, the last thing I would have done is admit I'd flown myself into a dangerous corner. "The flight was fine, nothing to worry about," I would reply, even if I was still mentally chastising myself for flying such a dumb-shit stunt.

Most of the astronauts flying out to Downey would stay at the Tahitian Village, a cute local hotel dressed up in mock-Polynesian Tiki style, with fire dancer shows most nights and a lively bar. We became good friends with the manager, and I don't think we ever stayed at another hotel in that city. I remember arriving there one evening after some grueling desert survival training in Spokane, Washington. I had to be in Downey for some testing early the next morning, so I flew the long trip from the top to the bottom of the country without bothering to clean myself up. By the time I reached the hotel, I was exhausted and ready for a long night's sleep. I passed the other astronauts in the bar with only a quick hello, grabbed my hotel key, unlocked the door, and the room was completely empty.

—no bed, chair, television, or dresser—nothing. The only thing left in the room was an unsigned note, which made some joking reference to survival training.

I was the victim of a prank, or “Gotcha,” as we called them, but I wasn’t going to let the guys in the bar win. I knew they were now waiting for me to return and accept their taunts. Instead, I found a telephone and called Ruby, the switchboard operator at the Downey facility. The quintessential “little old lady,” Ruby knew everyone at the North American plant and could solve any problem. Her house was just down the street. I borrowed a sleeping bag, some pots and pans and other camping equipment. I bagged up some ashes from her fireplace, and also collected some rocks and tree branches. Then I snuck back to the hotel and made up the room with a sleeping bag in the corner, rocks and ashes in the middle of the room arranged like a campfire, and a cooking tripod made out of branches assembled over it. I hung a can of beans from the tripod as the final touch. Next, I went to the Tiki-style tropical ponds that dotted the hotel complex and caught a dozen frogs. After placing the frogs in the room and closing the door, I cleaned myself up and nonchalantly strolled down to the bar.

Of course, all of the guys in the bar were waiting for my reaction and were puzzled that I acted so normal. After a couple of minutes, the questions began. “How do you like your room? Is it comfortable for you?” I replied that yes, it was perfectly fine. Not satisfied, they asked, “Can we go with you to see your room?” So we all trooped up there, I opened the door and let them in. You should have seen their faces as they took in the campsite in the room, while frogs hopped out the door and back toward the ponds. I left them to it while I calmly strolled away, requested a key for an alternate room and had a well-deserved rest in a comfortable bed. Gotcha!

The Downey facility was fascinating. I would spend most of my time in the enormous “clean room,” where even the air was scrubbed to surgical operating room standards to ensure that the spacecraft built inside were immaculate. To enter that area I put on a protective white overgarment with a hood, walked across sticky pads to remove anything stuck on my shoes, and passed through an area where large fans blew away any remaining dust particles. Only then was I granted admittance. It felt like entering a science-fiction movie, especially when I saw the line of gleaming Apollo command modules, all in different states of construction. In this room, North American built spacecraft to go to places only previously imagined in movies and novels. Now, we were going to do it for real.

If I wasn’t in the clean room, I was in another manufacturing area, busy creating procedures for a crew to follow if their spacecraft malfunctioned in flight. One astronaut perk was access to the “Golden Trough,” as the executive dining area was nicknamed. Getting to know all of the senior managers at North American, as well as working with all of the engineers, was very useful. We astronauts had someone to talk to at every level of the company if we had problems or concerns, from Ruby all the way up to the company president. I spent most of my time, however, with the technicians, because I was busy working in a spacecraft as it was built and tested.

I was at Downey one Friday in late January 1967. Only a few hours remained until I could fly home for the weekend, and I was looking forward to the break. I’d worked all day with the Apollo crew of Tom Stafford, John Young, and Gene Cernan, who were training in a Block I command module. At the same time, the crew of the first planned Apollo flight, Gus Grissom, Ed White, and Roger Chaffee, was running some tests inside their Block I spacecraft, which sat on top of an unfueled rocket on the launchpad at Cape Canaveral. Liftoff was planned for the following month.

I was in the astronaut offices at the plant when I received an urgent phone call from Deke Slayton. There had been a fire inside the spacecraft at the Cape, he told me, and all of the crewmembers were dead. Stafford, Young, and Cernan needed to get out of the near-identical spacecraft at Downey, and

all further testing was canceled. Deke was terse and businesslike: there would be a lot of work to do and funerals to attend, so the four of us needed to get back to Houston as soon as possible.

Racing to the control room, I called down to the spacecraft test area, where a technician put Stafford, the crew commander, on the phone with me. He didn't want to believe that our three colleagues in Florida were dead. I couldn't blame him. I didn't want to either. Once the news sank in, Stafford hurriedly told Cernan and Young. Then the four of us met in an office where I shared what else I had been told.

I explained to my stunned colleagues that Gus was inside the spacecraft with his crew when a fire had broken out. Despite heroic attempts, the spacecraft hatch had not been opened in time to save them. I'd been an astronaut for less than a year, and other than racing cars with Gus, I had not had time to get to know any of the three men. Nevertheless, as we prepared to hustle back to Houston, I found myself imagining the screams of the trapped crew as they died.

After racing back to the airport, John Young and I sped back to Houston in one T-38, while Tom and Gene flew another. We arrived around midnight.

Pam was at home when I unlocked the door. She had heard the news, of course. Days like this were what she always feared. My career dreams had brought me close to danger and death many times, and it could easily have been me in that fire. On this night, was Pam scared or angry, or both? I am sorry to say I don't know; we didn't discuss it. My mind was somewhere else entirely. I was more concerned that the program might die, and with it all the work that I had done.

Thinking about it now, with regret, I can see that Pam and I had no place left to comfort each other. We were both shaken up, but for completely different reasons. And without the ability to help each other on those darkest of days, our marriage was doomed.

Instead of talking, I busied myself for work the next morning, knowing it would be an extremely tough day. In fact, for all I knew, it might have been the beginning of the end for NASA. Politicians and administrators respond to death in a different way than pilots. As I went to sleep, I wondered if the loss of Gus and his crew might lead to the cancellation of the entire Apollo program.





## CHAPTER 5 THE FIRE

The morning after the fire, most people I talked to were still in shock. Many of my colleagues knew those three guys well and found it tough to believe that they were gone. The astronaut corps, however, felt a particular kind of angry frustration. For civilians and taxpayers, the astronaut deaths were distressing and unexpected. But military pilots were familiar with death, and we also felt angry. Even though many aviators die in flying accidents, Gus, Ed, and Roger died conducting tedious tests in a spacecraft that never left the ground. To perish this way seemed doubly wrong. But we all needed to put our emotions to one side, regroup, and try to find the cause of the fire and the reason our colleagues could not get out in time to save their lives.

It turned out that there were multiple reasons, and everyone involved with that spacecraft shared the blame. The fatal test was performed using pure oxygen under high pressure, which meant a fire could spread quite easily. NASA management, the spacecraft manufacturers, and the astronaut corps all allowed materials to be used in the spacecraft that could catch fire without much difficulty. In addition, loose wiring inside the spacecraft was vulnerable to kicking and chafing.

But it quickly became evident that the spacecraft hatch was the major cause of my colleagues' deaths. Had just one of them been able to open it up, they would have survived. The hatch design was a disaster: it sealed from the inside, so the greater the interior pressure, the tighter the seal. For keeping a spacecraft airtight in space that design made sense, but it was lethal during a pressurized test on the ground. It was an example of a system designed by nonpilots; safety was not the most important factor.

North American Aviation built the spacecraft and naturally shouldered much of the blame. But the accident was more complicated than that. I believe there were too many people involved for one specific group to be responsible. Others blamed the tragedy on the intense pressure to fly Apollo to the moon before the end of the decade. Yes, there was pressure, but personally I don't think it directly led to any oversights. The cause of the fire was tougher to swallow. The fault belonged to all of us: how can you blame any one person or group for something that everyone had overlooked?

No one had taken the time to consider that an electrical spark in the spacecraft, while unlikely, would be disastrous. For three dangerous ingredients to come together like this—flammable material, sparking wires, and pressurized pure oxygen—a lot of details must have been overlooked by a lot of people, and not just those at North American. These details were probably missed because, until January of 1967, everything had worked fine, so we were overconfident. No one wanted to stop and think about potential problems. In this instance, it killed three men.

I later heard talk about shoddy workmanship on the Apollo spacecraft by North American and accusations that this problem may have contributed to the fire. But in the months before the fire, I saw

just the opposite. North American's engineers were very particular, detailed, thorough, and determined to do a good job. I was especially impressed with how well they kept records. Initially, I thought the amount of paperwork they required was too much. But one night we were checking a spacecraft and found that one particular wire inside a large bundle did not work—it had chafed and exposed raw wiring. The company went back to their records and diagrams, and within days had replaced not only that particular wire, but every piece of that faulty batch of wire in every part of every spacecraft it had assembled. Damn impressive.

Not long after the fire, I was assigned back to Downey to resume work on the Block II spacecraft. This time, my job was to improve everything we could, based on the lessons of the fire. Jack Swigert, who would later fly on the Apollo 13 mission, joined me in this important duty. Because of his work improving the command module, Jack probably saved his own life years later when Apollo 13's service module failed and he helped to bring the crippled spacecraft home.

A lifelong bachelor, Jack had a party at his house every weekend and dated every woman in sight. He was a real skirt chaser and a playboy. He spent a lot of time in Miami, where Eastern Airlines had a flight attendant school. I guess the odds of dating were much better around all of those young women. He was also notoriously tight with money, asking a girl out on a date only to have her pay. There was one story going around about a girl he dated in Washington, D.C. He not only asked her to pay for dinner, but also to fill his car up with gas, telling her that he had forgotten to bring any money. He was apparently upset when this girl did not invite him back to her place—but no one could blame her.

All of this behavior was generally considered okay; no one cared about Jack's private life as long as he did his job as well. Thankfully, he was very good at what he did. He'd been a fighter pilot and a great test pilot before joining NASA and was well regarded in the flying fraternity.

I was confident that the Block II spacecraft we worked on before the fire was already a fine vehicle. Still, to make it even safer, Jack and I worked with the North American and NASA engineers to help redesign the equipment inside, replacing anything flammable with fire-resistant materials such as Beta cloth. It took us months to figure out everything that needed to be done. Because of the work carried out by everyone involved with the spacecraft in those first crucial months, we pulled the Apollo program back from the brink and removed any fears of cancellation. NASA had to earn confidence in its abilities all over again, and it did. *We* did.

I felt no apprehension at all getting back into an Apollo spacecraft right after the fire. I knew that we were going to make the upgraded command module the safest space vehicle ever built. My engineering background, I think, was the major reason I was assigned to this task. I spent months inside the spacecraft, helping to develop and test new malfunction procedures, getting familiar with the systems and then redesigning them. While Jack Swigert and I worked on our procedures, the spacecraft hatch was also redesigned. The Apollo command module soon had an outward-opening hatch with a quick-action lever, and it worked excellently.

Jack and I spent countless hours going over every single system, working on elaborate diagrams to show what would happen if multitudes of different actions were taken. The spacecraft engineers had created procedures to describe what a crew should do if something went wrong with the spacecraft, and the flight controllers in Houston then modified them. Until tested in a real spacecraft, however, we had no idea if the procedures would really work. Jack and I needed to make sure. We soon found that the procedures, based on spacecraft blueprints, did not always match the reality. So we went through every detail of every imaginable flight moment with each spacecraft part, and did a great deal of rewriting to perfect the procedures. The collaboration produced an enormous malfunction

procedures manual that every Apollo crew consulted diligently in their training.

I was in California every week for at least a year and a half doing this crucial work. I would leave Houston on Sunday night and was back by Friday night unless a test overran into the weekend. For the amount of time I spent there, I may as well have bought a house in Downey. I got to know hotel rooms far better than my own home. We were determined to get back into space again, and all other considerations—including our family lives—were sidelined until we achieved this goal.

If I thought the tragedies of 1967 were over after the fire, I was wrong. In June, Ed Givens, an astronaut in my selection group, died in a car crash close to the space center in Houston. Only a few months later, in October, we lost another astronaut. This time, it was someone I knew well. C.C. Williams had just learned that he and his wife, Beth, were going to have a second child. He was flying a T-38 when something went wrong. Somehow one of the aileron controls on his wing became stuck, causing the aircraft to roll and then nose down. C.C. tried to get the airplane under control, but it was impossible, and by the time he gave up and bailed out there was no time for his parachute to open. NASA lost one of the nicest, most humble guys I had ever met.

C.C. perished a month before Mike Adams, another pilot I had met at Edwards. Selected as an astronaut for MOL before transferring to the X-15 rocket plane program, Mike died while flying an X-15 back from a suborbital spaceflight. It was a horrific year for the American space program, worsened when MOL astronaut Bob Lawrence was killed in December in yet another airplane crash.

America had just lost seven astronauts in one year. Not surprisingly, the deaths of my colleagues did my marriage little good. In retrospect, telling Pam that I was joining the astronaut corps the year before had been a nail in the coffin when it came to our relationship, and I can only guess that the Apollo 1 fire was privately very traumatic for her, too. After all, I was training to do the same things as my now-dead colleagues.

In hindsight, the Apollo 1 fire was much tougher on Pam than it was on me. To my dismay, I began to understand that she would rather be divorced from me than constantly dreading the day when someone would inform her I had died in an airplane or spacecraft accident.

At the time, I really couldn't understand her point of view. I didn't see what difference it would make. If you lose a person, I reasoned, you lose them, and it does not matter how. Perhaps Pam wished to keep her own initiative and choices, rather than leaving it to fate. For now, however, although we were essentially living separate lives, we officially stayed married. I was working so hard in California that year that I was hardly ever home anyway, even if she had wanted me to be.

It was also a terrible year to become an astronaut. When I was selected the year before, NASA also began to recruit a new group of scientists into the astronaut corps in the belief that, although none were jet pilots, they could be trained to fly with us in space. There would be missions to a number of space stations then in the planning stages, they were told. However, by the time eleven had been selected in August of 1967, our budget had been severely cut. The number of missions shrank, along with the need for these extra astronauts. On their first day in Houston, Deke Slayton told them bluntly and honestly that they were not needed any more. Over the next couple of years many of them quit and returned to their scientific careers; the others endured a long wait of more than a decade before finally flying on the space shuttle. Some of those guys became great pilots and good friends of mine. But the writing was on the wall from the outset. They would not fly Apollo missions, and it was beginning to feel like not all of my group would get the chance either.

So 1967 was a gloomy and difficult time. At the end of the year, however, I received some good news. Ed Mitchell, Fred Haise, and I were reconfirmed as the support crew for a new version of the planned second manned Apollo flight. Despite losing colleagues, ominous budget cuts, and the

gradual disintegration of my marriage, I kept some modest pride knowing that my hard work was paying off.

Our support crew didn't stay the same for long: Jack Lousma soon replaced Fred Haise, who was pulled away to other duties. The planned mission was a prestigious one: the first test flight of the lunar module. Our roles, however, were anything but glamorous. We did the dog work, helping the crew with planning, meetings, and any other little details they needed to clear up. We even brought them coffee if they asked for it.

This would be the first mission where two American manned spacecraft would link together, and so the docking system was a vital new piece of engineering that could *not* fail. I was asked to focus on this key element of the mission. While Ed Mitchell was out on the East Coast working on the lunar module, I was back at Downey and at the Cape, working on this docking system. I was basically out there on my own, which I took to be a good indicator of how much Deke trusted me.

Did the support role mean I might soon be on a backup crew? I didn't know. I simply tried to do the best job I could. I was grateful to be working for one of the best prime crews that NASA had ever assembled. Jim McDivitt was mission commander. He knew not only what he wanted to do, but also how to do it: the sign of a good commander. He was very decisive, but also very nice about it.

Jim was a ball of fire. Slightly built and with a sunny disposition, he laughed a lot and made things easier for the crew. He was good at taking suggestions and making decisions. While training with him, I discovered that his parents had moved to Jackson, Michigan, when he was in college, and they now lived only two blocks away from my parents.

As I got to know him and his wife, Pat, we soon became like family. Through Jim's parents, the two of them even uncovered the nickname my mother had used for me when I was young. Jim began to call me "Sonny" on every possible occasion. Four decades later, I have almost forgiven him.

At the time, I didn't get to know the other two prime crewmembers well. Rusty Schweickart was the lunar module pilot, which meant that, like Ed, he spent most of his time on the East Coast with the lunar module, so I rarely worked with him. The other crewmember, command module pilot Dave Scott, was someone I only saw during the major tests and checks on the command module at Downey.

I remembered Dave Scott from West Point, and it was no surprise to me that his star had continued to rise. Like me, he'd spent some time at the University of Michigan and as an Edwards test pilot, although in different years. But he'd also managed to squeeze in graduate work at MIT, served in a fighter squadron overseas, and was selected by NASA as an astronaut a full three years ahead of me. He was four months younger than me, yet had outpaced me on all career fronts. The guy was damn impressive, and NASA's golden boy. I think everyone in Houston believed one day Dave would be the chief of staff of the air force. He just seemed destined for greatness.

My good opinion of Dave grew as I got to know him better. He was at the very least the equal of anyone in the astronaut office—and I suspected he was better than all of them. When he came to check out the spacecraft, he took meticulous notes, then gradually checked off each item to ensure that everything was resolved to his satisfaction. Absolutely no detail, however small, got past him. He'd flown in space once before, on the Gemini 8 mission in 1966 with Neil Armstrong, bedeviled by a stuck thruster which spun the spacecraft out of control. Dave and Neil nearly passed out, but kept their cool and saved the spacecraft and their lives by regaining control and returning from orbit. They impressed their NASA colleagues, especially their fellow pilots. They had taken care of the problem and made it home. Less-skilled pilots would have died up there.

During my year preparing and checking the mission's command module in Downey, I came to know every mechanic, test conductor, and technician who worked on the spacecraft. Every day I was sure to

ask them if there were any problems. If something is wrong, I said, please share it with me. I assured them I would get the problem resolved. It was a lesson I'd learned when running the armaments shop back in my fighter squadron days. The spacecraft was the most important thing in the world to me; it had to be flawless. I told the team of technicians that if a problem arose with the command module, I would keep it within our small group while we fixed it. But I also promised there would be hell to pay if something was wrong with the space vehicle and they didn't tell me about it.

In August of 1968, to our surprise, we learned that instead of testing the command and service module along with the lunar module in Earth orbit, the second manned Apollo mission would now fly all the way to the moon and back. The lunar module was slipping behind in its development and would not be ready in time for the proposed launch date. If America didn't send astronauts to orbit the moon soon, the Soviets might beat us to it. So NASA shuffled the order of flights. Deke told Jim McDivitt that his crew would still be the first to test the lunar module, but they would now fly the third manned Apollo mission. The spacecraft I worked on for a year would now fly with a different crew—minus a lunar module—on the prior flight.

The stakes were now even higher for the command module. It would take humans around the moon, and the service module attached to it had only one engine to get the crew back to Earth. If something went wrong, three astronauts would be stuck circling the moon forever.

But before the command module I worked on could fly, NASA had to successfully carry out the first manned Apollo mission, our first flight since the fire. The Apollo 7 mission, as it was named, was commanded by my old mentor and friend Wally Schirra. It was a huge confidence booster for NASA to fly again after the tragedy of the fire, but I was so busy when Wally's crew launched in October 1968 that I couldn't pay much attention. Besides, I had every confidence in the Apollo spacecraft and knew that once they entered orbit they would be just fine. If anything went wrong, they could come home at once.

Apollo 8, the next mission, was a very different story. The crew would leave Earth orbit and eventually lose sight of our planet altogether as they orbited the moon's far side. Nothing could go wrong with the spacecraft had worked on so hard.

In December of 1968, I watched the Apollo 8 liftoff at the Cape. In addition to sending that spacecraft around the moon for the first time, we launched it on the mighty Saturn V rocket. It was only the third time that this rocket had ever been launched; the prior two launches were unmanned flights. The previous test had not gone perfectly; severe engine oscillations violently shook the rocket as it climbed into space. Some of the engines had also failed to fire for as long as they should have. The designers believed they had fixed all the problems. Still, it was a gutsy decision to put people on top of the rocket on the next flight. That NASA was willing to take the chance demonstrated confidence in both the machine and its designers.

As the countdown approached zero, I stared transfixed at the gleaming white rocket, set against a bright blue morning sky. The Saturn V was beautiful. Three hundred and sixty-three feet tall, it was as big as a skyscraper, and even from our safe viewing point three and a half miles away it looked impossibly large. Although I understood the physics and knew that this huge vehicle was about to lift itself off the ground, it was hard to believe that an object longer than a football field could actually propel itself into space.

When the rocket engines fired, the experience became even more unreal. Glowing clouds of smoke billowed outward as a stab of bright light flared from the rocket's base. But it all happened in silence; the sound wave took time to reach our ears. As the rocket slowly began to rise on a column of yellow fire, the noise and thunderous vibration caught up to me. It was overwhelmingly, mind-blowingly

immense. Someone told me later that it was heard a hundred miles away. That humans could create something this powerful amazed me.

The Saturn V rose so slowly that the noise beat into the ground and into my chest for about twenty seconds, vibrating everything around me, before the massive rocket picked up speed and arced away and up into the sky. Soon it looked like a tiny white needle, curving out over the ocean and disappearing into the blue haze.

The spacecraft I had labored over was now safely in orbit. Humans were heading to the moon for the first time. And that command module worked like a dream, with the fewest problems of almost any flight in the program. After orbiting the moon ten times, my colleagues returned safely to Earth without a hitch. We grew ever closer to a lunar landing. First, however, was the Apollo 9 mission.

As a member of its support crew, Apollo 9 was the first flight in which I truly had a stake. We only had two months after the Apollo 8 mission to finish planning and prepare to launch. NASA was hustling to get the lunar module ready for its first manned test flight, while I worked on the command module, finalizing the checkouts and the docking tests. We were acutely aware of time running out. It was the spring of 1969, the year NASA planned to land astronauts on the moon. We had a lot of test flying to do before that could happen.

When the Saturn V carrying the Apollo 9 crew thundered off the launchpad in early March, I was aware that three friends—Jim, Dave, and Rusty—were aboard this time, which was quite a different feeling. I had worked with these guys for a year and naturally felt very relieved when they safely reached orbit. Although they were not going to journey to the moon, in many ways their mission was even more important. They tested all of the elements required for a moon landing: the command and service modules, the lunar module, and the spacesuit designed for the lunar surface. When Jim and Rusty entered the lunar module and undocked from Dave in the command module, it was a real test of faith; Dave now had the only spacecraft with a heat shield. In order to return all three astronauts safely back to Earth once the test flying was done, it was vital that the two spacecraft find each other in orbit and redock.

Flying solo in the command module, Dave had an enormous responsibility shouldered by no astronaut before. He had to know how to hunt down and rescue his two crewmates if anything went wrong with their lunar module. Dave carried out his duties perfectly. After ten days, the crew returned safely from Earth orbit in the command module. The two spacecraft had successfully test-flown together, and we now knew that the lunar module was a great flying machine.

After Apollo 9, it was clear that Dave Scott was on a career fast track. Dave splashed down on March 13, and by April 10 NASA publicly named him as the backup commander for Apollo 12. For all NASA knew at that time, Apollo 12 might end up being the first lunar landing, so Dave had gained a plum assignment. He'd earned it.

As a backup commander, Dave needed two other astronauts on his crew. I was in my office in Houston one day when Dave put his head around the door and asked me to join him in a meeting with another astronaut, Jim Irwin. After the three of us sat down in his office, Dave came right to the point, telling us casually that he'd been assigned to the mission. Would we like to join him on the backup crew?

I answered right away: "Hell, yeah—absolutely!" I was enormously pleased that Dave wanted me on his crew. I had always been somewhat in awe of him, so his offer was a dream come true. Although the backup crew does not normally get to fly the mission, they generally became the prime crew three missions down the road. If we played our cards right, Dave explained that day, we would be the prime crew for Apollo 15. It looked like we were all going to fly to the moon, perhaps as early

as the following year.

I have no idea why I was selected for that crew. I suspect that I would have been assigned to an earlier mission if it hadn't been for the switches of missions with Apollo 8 and 9. As it was, I think my name, and Jim's, were simply next on the list of eligible astronauts. I had a feeling that our peers rated Jim and me highly for the work we had done, and that Deke Slayton probably asked Dave if we'd be good additions for his crew. I believe that Dave was happy to have us. Certainly, if he'd had any objections, we would not have flown with him.

Whatever the reason for my assignment, I knew some of the hardest work of my life now lay ahead. A known perfectionist, Dave would be a tough boss. It wasn't hard to see the signs of his disciplined West Point background. I knew that training with him would be a challenge, but if I could handle it, I would end up a better astronaut and a better person.

There were three different Apollo crew positions: commander, command module pilot, and lunar module pilot. There never seemed to be any doubt that I would be named as the command module pilot. Even for Apollo 9, I specialized in that spacecraft and its docking mechanism. I'd spent so much time working with command modules at Downey that I already had a lot of experience related to the position. It never felt like a conscious decision, simply the way my experience had directed me. Jim Irwin, on the other hand, had helped to develop and check out the lunar module. It made perfect sense that he would be the lunar module pilot.

Of those two positions, which was the better one? It was a tradeoff. The command module pilot was able to fly a spacecraft, but the lunar module pilot set foot on the moon. I guess if your goal was to walk on the moon, disregarding everything else, then being a lunar module pilot was the safest bet. But despite the title, you were essentially a systems engineer in the lunar module. You monitored the spacecraft while the commander, in this case Dave, flew it from lunar orbit to the lunar surface and back. In the meantime, the command module pilot flew the command and service module to and from the moon, as well as solo in lunar orbit, and was responsible for docking with the lunar module. I was keener on the idea of actually flying something. Less glory, but more flying—that was my tradeoff.

There was another consideration: the best route to become a mission commander was to first serve as a command module pilot. Dave Scott had just done that. The reason was simple: if you spend years training to be a command module pilot, then you only have to learn how to fly one other spacecraft when you become a commander. A lunar module pilot would have to learn how to fly two. It wasn't impossible, just much harder, because it took at least a year and a half of full-time training to understand just one of those vehicles.

I was proud to be the first person in my selection group to be assigned a command module pilot crew position. In fact, I was the first person with no prior space experience to *ever* be assigned that slot for a lunar flight. It felt like a huge honor; the kind of thing Deke only did if he thought you were up to the task.

Jim Irwin and I had joined NASA at the same time, and this was the first backup crew assignment for both of us. An air force test pilot and University of Michigan graduate like me, Jim and I didn't know each other before the space program. He had been at Edwards a few years before I got there. He worked on the precursor to the SR-71 Blackbird spy plane. He'd originally applied to NASA in 1963, but was rejected because of injuries he received in a horrific air crash two years earlier. There had been some doubt that he would ever pass the physical, but he got in on his second try, because he worked hard to get back into condition.

Jim and I, now sharing an office, quickly became good buddies. Slim and sleek, Jim was a runner

and a weight lifter, muscular with dark, slicked-back hair like a beach boy. He was also very handsome, and probably could have used his good looks to get his way with a lot of people. But I never saw him play that card. During our training, Jim was mostly quiet and withdrawn. He could be very thorough and detail oriented, which was a great asset for a crew. But he was also extremely laid-back. There were times when I felt like shaking him and shouting “Jim, are you there?” He was so restrained and reticent; I really wished he would come out of his shell.

An interesting dynamic soon developed between the three of us. Dave was the quintessential professional, thinking way ahead of everyone, and Jim never disagreed with him. As I grew in confidence, occasionally Dave and I had differences of opinion. There were mission tasks I thought should be done a certain way, and I believe that I thought them out pretty well. Dave, however, had also considered them closely, and he had a different twist on them. He wanted things his way, but on a few occasions I had to tell him, “Well, Dave, I am not sure I want to do it like that.” Jim never said a word.

I always really liked Jim, and I would have done anything for him. Still, I often wished that he would get angry, or at least say *something*, when these disagreements came up. He was not assertive about his input into the flight preparations, such as procedures and flight plans. Jim’s reticence left me to argue with Dave. Our arguments were a healthy process, but Jim receded in the face of even a healthy conflict. I would get so frustrated, because Jim would never stand up for anything, or even tell me if he agreed or disagreed with me. I began to think of him as Dave’s shadow.

Oddly enough, it all worked out; we trained very well together. Perhaps we needed different personalities to make a good team. With Jim as his yes-man, Dave could get everything done his way, in a thorough, detailed manner. Jim wouldn’t have much to do on the flight except watch over the systems, and he excelled at that. In a way, he would be along for the ride until he stepped on the moon. Jim didn’t really have the kind of personality to become a mission commander. He would be an extension of Dave’s thoughts and actions, which was not necessarily a bad thing in a lunar module. If Jim was a follower not a leader, he had a great leader in Dave.





*With Dave Scott (left) and Jim Irwin in front of the spacecraft simulators*

My occasional disagreements with Dave never held up our work. Jim and I tended to follow his lead on everything. He really worked us hard and led us so well that we were soon obsessed with preparing Apollo 12 for flight. In fact, the more I trained with Dave, the more my respect for him grew. We didn't have a bond of friendship; we had something rarer—a bond of competence and professionalism.

We three differed considerably from the prime crew. Pete Conrad, my racing colleague, was very close and loyal to his crew of Dick Gordon and Al Bean, both during Apollo and for the rest of his life. I believe Dick and Al had the same feelings of loyalty to him. Naval aviators who had all known each other long before they came to NASA, to the outside world they seemed like brothers. They did everything together, driving identical gold-and-black Corvettes with their crew positions painted on the sides. They showed the world that they were a tightly bonded team.

Our crew saw those Corvettes not only as a deliberate challenge, but also as a little tacky. So we did something a little different. We obtained matching Corvette models, but Jim's was red, mine was white, and Dave's was blue. Each had bold red, white, and blue stripes painted right down the center of the car. We were a team, but we were also individuals.

The different cars seemed symbolic of the differences between our crews. The Apollo 12 guys

went everywhere together. If you saw one gold-and-black car, you would see three. Eventually, this caused some problems, because astronauts don't always want to be recognized. Sometimes, it was better to disappear into the woodwork. Our crew didn't have that problem, as you would rarely see our three cars together.

Although we didn't socialize much as a crew, I spent a lot of time with Jim in Houston. Down at the Cape, the three of us played handball and tennis, and went out to dinner and the bars. Outside of those moments, however, our crew was never too close. I recall feeling like I could never completely let down my guard. There was always a little thought in the back of my head: I never wanted to put Dave Scott in a position where he could say anything negative about me. He never did during all of our training together, and I am not sure he ever would have. Nevertheless, I couldn't quite shake that nagging feeling.

I admit I envied Dick Gordon, Pete Conrad's command module pilot. I held the same position on the backup crew, and as Dick's immediate backup I came to know him very well. He soon became perhaps my closest friend in the entire program. Gregarious and mischievous, Dick is one of those rare colleagues who can do excellent, hard work while keeping things fun. When the workday ended, he could really let loose. I enjoyed his company greatly. I still do.

The Apollo 12 support crew of PJ Weitz, Ed Gibson, and Jerry Carr were a bunch of pranksters, too. For the postflight party, they created a great home movie starring a guy in a gorilla suit and a girl in a bikini inside the spacecraft—zany stuff. They dressed me in a bald cap and glasses to play a mad scientist and filmed me speeding around the Cape in a Formula Vee racing car. The crew fell over laughing when they watched the movie.

Dick and I spent a lot of time together flying back and forth to Los Angeles, where we worked on the Apollo 12 command module at Downey. I had been making that trip so much by then that it was second nature to me. I knew where the pay phones were, the rental cars, and the hotels; I could have found them blindfolded. A good thing, too, because with no distractions, I could really zero in on the work.

I particularly recall one trip when Dick and I were flying from Houston to Los Angeles in a T-38. As usual, our clothes hung in wardrobe bags between the front and back seats. It was the only place to stuff them in that aircraft. We landed in El Paso for a quick refueling, opening the canopy while the aircraft was refueled by the ground crew. As we taxied back to the runway to take off, Dick started to close the canopy. Somehow, the clothing bags became caught in the mechanism, and before we could stop the process the canopy came loose. Crap, we thought, we really messed up. We couldn't fix it ourselves, so we taxied back to the hangar, and let the maintenance crew take over.

We still needed to get to Downey and couldn't wait around, so we grabbed our bags and parachutes, put our flying helmets in special bags, and rode over to the commercial flight terminal, where we could catch a passenger flight to Los Angeles. We were able to find seats on a Continental Airlines flight, one that was leaving immediately.

The flight crew put us in the front of the airplane, where we stowed our helmets and hanging bags, and belted up our parachutes. As the other passengers boarded, there we sat. They freaked out. "What is wrong with this airplane?" they demanded of us. "Are you guys going to bail out?" We couldn't stop laughing. It was a great, inadvertent "Gotcha" on all of those passengers.

I had a great time working with Dick on his command module. I already knew a lot of the systems inside out, but being a backup crewmember brought a whole new level of training. If anything happened to Dick, I would be flying to the moon in his place. I needed to learn that spacecraft thoroughly. Considering it was such a small vehicle, it is amazing how complex it was.

Not many people understand that American spacecraft like Apollo were flown solely by the pilots on board. Mission control could never control a spacecraft from the ground. They could send us information, either verbally or by transmitting data, but the astronaut had to perform an action inside the spacecraft to carry out the request. It was different from how the Soviets operated at the time, because their spacecraft were far more automated. This difference was something very important to us as pilots.

Another misconception is that the Apollo spacecraft used cutting-edge technology. In fact, the spacecraft that flew in the late 1960s and early 1970s used equipment mostly designed in the 1950s. I believe this was a conscious decision by the designers at NASA and North American: better to have something reliable than cutting-edge. I think all of the astronauts were happy with this decision.

Simple systems either work or fail. There is nothing in between. If the systems were lost, we had no real backup for many of them. However, repeated testing over the years had proved that their success rate was very high. I would rather fly a proven system than the space shuttle, for example, which has many computers that all have to talk to each other and then mutually agree. There is an analogy with flying multi-engine versus single-engine aircraft. It surprises people to learn that there are more accidents in multi-engines. If you lose your only engine, you quickly look for a place to land. If you have multiple engines, you may try to keep flying, which becomes increasingly difficult and dangerous. Simpler is often better.

Our computer was a good example of spacecraft simplicity. It was designed by MIT as a rudimentary piece of hardware. It was literally hardwired: you could zap it, turn the power off, and do pretty much anything else to it, and when the power came back on you were right back where you had been before. It had no silicon chips to burn out, was extremely reliable and virtually indestructible. Of course, simplicity came at a price: our computer had less storage memory than the average modern wristwatch.

Many of the tasks the computer needed to perform on an Apollo flight were already hardwired inside. The lack of storage capacity, however, prevented us from preloading all of the programs needed for the flight. For a simple thrusting maneuver, for example, we had to load in the data. The computer had no room at all for a particularly important program, called “Return to Earth.” The ground would need to send that one to us when we were in lunar orbit.

To navigate in space between Earth and the moon, we required two pieces of information. One was the attitude of the spacecraft compared to some fixed frame, such as the field of stars all around us. The attitude—in simple terms, which way we were pointed—was needed so that we could aim the craft during thrusting maneuvers and keep on course. The spacecraft had a set of gyroscopes to tell us. Attitude was not something we could otherwise know for sure in zero gravity, where there is no up or down. It was the equivalent of an attitude indicator in an airplane, which tells you if your wings are level. Crucially, we could also measure acceleration forces on the spacecraft, so we could gauge the accuracy of our engines when we fired them.

The other information we wanted was the precise location of the spacecraft in the Earth-moon system. We always needed to know *exactly* where we were. The team on the ground could track the spacecraft by precisely angling their large antennas, located on different parts of the globe. By measuring the precise timing of a return signal from the spacecraft and comparing the results, mission control could compute our location and speed with great accuracy.

Without constant checking, however, uncertainties about our position could grow larger over time. And no system was foolproof. Mission control’s calculations of our location would be useless if our radio failed and they could not share them with us. We also had one gyroscope set in the Apollo

spacecraft, which we tested mercilessly before flight. Yet no matter how perfect we could make it, a little friction would always be acting on the gyroscopes. We needed to be able to calculate and correct any drift.

So, Dick and I focused on discovering our attitude and location with no help from the ground. We could be in lunar orbit with no working radio, and three lives depending on our own calculations to thrust the spacecraft out of lunar orbit in the right direction for a precise reentry into Earth's atmosphere many days later. We needed at all times to be able to independently work out our state vector—that is, to find out precisely where we were within the Earth-moon system, how fast we were going, and what direction we were headed. We were navigators, and although we had some sophisticated equipment, Dick and I still had to master the same skills that ancient mariners once used to cross the oceans.

We would navigate using a sextant much like those used for centuries by seafaring navigators. The sextant was located in the equipment bay, at the bottom of the footpads where our feet usually rested. In space, an astronaut could float down there and have enough room to look through the optical equipment while in a standing position. We'd peer through a telescope with a wide field of view to locate stars we used as guide stars, then shift to a telescope with a much narrower field. By using the optics for sighting and the onboard computer to measure the line of sight to a star, then repeating that procedure with several stars, we could determine our exact attitude in space. By sighting on different stars and measuring their angles, the computer could average out the information.

Using that same equipment but this time using a split prism to form both a fixed and a movable line of sight, we could also precisely measure the angle between stars and the horizon of Earth or the moon. Their positions would look different against the starry backdrop as we traveled between the two, and these differences could be measured. The more sightings we made, the more accurately the computer could calculate our location and direction, until we knew precisely where we were.

It sounds complicated, but it was technologically simple. There were no science-fiction-like computers to tell us what to do and make enormous calculations on our behalf. We relied on skills learned in extensive training and memorized the stars that would surround us on our journey. If we lost our navigation computer or our gyroscope, we had an even more basic backup method. We could resort to a World War II-era gun sight. We could clip this optical device to the edge of a spacecraft window, look through it just as you would with a hunting rifle, and line up the crosshair with a known star. We would then know the direction of the spacecraft's line of thrust, and that information was better than knowing nothing.

This all required a great deal of astronomical knowledge on our part, learning and remembering dozens of different stars that we could use to help us navigate. This knowledge was vital, however, in case we ever lost radio contact with the ground. We would head to the Griffith Observatory in Los Angeles, or the Morehead Planetarium in North Carolina, and use their planetarium domes to simulate the view of stars from space. Tony Jenzano, the planetarium director at Morehead, had a great way of training us. To begin, he would ask us to close our eyes. He would then spin the star field on the planetarium dome, ask us to open our eyes and tell him where we were. Over time, he would gradually decrease our field of view. It became increasingly harder to identify our position in the sky with fewer stars in our vision, so we really had to memorize them. Eventually he put us in a small box inside the planetarium with a ten-degree window cut into the front. Once again he'd spin the view and we would have to give him our position. Man, that was hard. But we were seeing the same view that would fill our spacecraft optics, so we had to master it.

The focus on astronomy meant that whenever I was flying anywhere in a T-38 at night, I spent far

more time watching the stars than I did looking at the ground. On moonless nights, above the clouds and away from city lights, the star view from my cockpit was stunning, and all the more interesting because I could now name hundreds of those stars.

While I was spending time in Downey with Dick to ensure the Apollo 12 command module was ready and training with Dave and Jim in case we needed to fly the mission, other important events were taking place. After the success of the Apollo 9 mission, NASA felt confident about flying back to the moon in May of 1969. With Apollo 10, they sent both a command module and a lunar module. Some spectacular test piloting proved that NASA was ready to go all the way on the next flight: a lunar landing.

Apollo 11 was in many ways the whole point of NASA's efforts over the preceding eight years. The Apollo program had been created to land humans on the moon and return them safely to Earth. I wasn't going to get an opportunity to fly until after that mission had taken place at least once. Although NASA still had an ambitious schedule of lunar landing missions, I had noticed how politicians were still whittling back the budget. Rather than the fulfillment of an ambition, I hoped that Apollo 11 would be the beginning of sustained exploration of the moon. Not least, I will admit, because I wanted to fly there myself and didn't want the program to end before I had my chance.

I vividly remember the moment in July 1969 when mission commander Neil Armstrong and Buzz Aldrin, his lunar module pilot, touched down on the moon. I had been on yet another trip to the North American plant and was in the cockpit of my T-38 at El Toro Marine Corps Air Station in Orange County, south of Downey, preparing to fly home. The tower at the airfield told me that Apollo 11 was about to land and asked me if I would like them to relay the audio coverage. "Absolutely," I replied. "I am staying right here." So I sat in the aircraft and listened to the magical, nail-biting, unreal moment as guys I knew gingerly guided a spacecraft to the lunar surface. We had done it. Humans were on the moon.

I didn't linger long enough to hear live coverage of Neil setting foot on the surface. I headed back to Houston, looking up into the late-afternoon sky and thinking, "My God. There are people up there, on the moon." My thoughts naturally strayed to my friend Mike Collins, orbiting the moon solo in the command module. It was a job I hoped I would soon be doing. For Apollo 12, I'd be one step closer to the action.

As Apollo 12's backup command module pilot, it was my job to strap the prime crew into the spacecraft out on the pad just before launch. I was in the spacecraft on November 14, launch day, making sure all of the switch settings were correct before Pete and his crew arrived. As I stood in the foot well of the spacecraft, the crew arrived, laughing and cracking jokes, and I began strapping them in. When two of them were inside, I had to climb out as there wasn't room for me anymore. After I squeezed out, Dick Gordon slid into the center couch, and I reached back inside to help strap him in.

As I wished him luck, I have to admit I was still a little jealous. Dick was about to fly to the moon with a couple of great guys. Pete Conrad's fearless and fun streak created a freedom among his crew to bond in a way I had yet to experience.

Once the hatch was closed, I headed down the elevator to a waiting car to take me back to the viewing stand for the launch. It was raining really hard by the time I reached the stands, but I never gave it a thought. The Saturn V was a tough rocket, and I figured that it would take more than a little water to postpone a launch.

The rocket lifted off, right on schedule. And then, less than half a minute after launch, a huge lightning bolt struck the spacecraft. The Saturn V was poking up into the clouds, and the lightning found a perfect grounding through the spacecraft and rocket exhaust all the way down to the pad. We

scrambled to find a radio. I could hear Pete talking a mile a minute as they tried to work out what had happened. NASA could have called off the mission right then, but they decided to keep going and see if everything still worked. The command module had temporarily lost its internal systems, but the separate system that guided the rocket was still functioning and kept them on course.

By the time they got into orbit, the mission was in pretty good shape. Basic, well-insulated equipment meant that the spacecraft survived. With some quick thinking, the power and instruments were brought back online. Once again, I was glad that it had been designed with such well-tested components. It was amazing—everything was fine—but I bet that the launch was a very scary experience for the crew. I know I would probably have crapped myself.

A couple of days later, Pete Conrad was ready to make his first step on the lunar surface. Neil Armstrong's first words as he stepped on the moon—"That's one small step for man, one giant leap for mankind"—were famous by then. Pete was Neil's polar opposite in temperament, and many people wondered what he would say when he made his own first step. We had sprinkled a whole bunch of suggestions throughout Pete's in-flight checklist, many of them so risqué that he would have been fired if he'd dared say them. He ended up using one that we'd written down: a joke about his height, or lack of it, that had been going around the astronaut office for a while.

As the world listened, Pete brought the house down with his clever wisecrack. Making his first step, he quipped, "Whoopie! Man, that may have been a small one for Neil, but that's a long one for me!"

Days later, when the Apollo 12 command module splashed down, Dave, Jim, and I were a backup crew without a purpose. We hoped the pattern would hold, and we'd be the prime crew three flights down the line. Nothing was certain, however, until there was a public announcement. Some Apollo backup crews did not make it to prime. Our work performance was key, but NASA also scrutinized any personal issues. Part of the concern was rooted in fear of negative press coverage. In the past, divorce had been one of those dreaded areas, and many astronauts held crumbling marriages together in the hopes of getting one more flight.

Pam and I had been separated for about a year by this time, and the marriage was beyond hope of repair. We had drifted further and further away from each other until there was just no other way for us to go. It was obvious to us both by then that a final, official divorce was the only option. Now came the toughest part: I had to go and tell Deke.

I certainly had reason to worry. I would be the first astronaut to publicly divorce before flying in space. There were really only two precedents I could look at. Duane Graveline had been selected as a scientist-astronaut in 1965, but his wife almost immediately threatened him with divorce, and NASA asked him to resign right away. It all happened so fast, I heard, that most astronauts were never even aware he had been at NASA in the first place. Apollo 7's Donn Eisele was the only other astronaut who divorced while in the program. He had done so in 1969 after his flight, only to be completely ostracized by the other astronaut families. Donn was hanging in there, but it seemed there was no chance he would ever fly in space again. I heard different reasons about why, but I knew one thing for sure: I did not want that to happen to me.

Perhaps, I thought, my choice was either to fly to the moon or to divorce. I might not be allowed to do both. If so, this was a hell of a place to find myself. I knew that I could have asked Pam to delay a divorce for another couple of years, until I had flown in space. If it had been a one-sided decision to split up, I may well have done that, and I think she would have done it for my sake. But it would not have been fair to her. I had too much respect for Pam to ask her to stay with me.

It was a very tough moment. My marriage had suffered for years because I had pushed my career so

hard. And now here I was so close to the golden prize. I suspected I was weeks away from being named to a prime crew for a lunar mission. I might have been throwing it away by being honest, but I decided that if divorcing was going to take me out of the program, then that was just too bad. I'd have to live with it.

It was with a bad case of nerves that I asked to meet with Deke in his office, where I laid out the facts clearly and honestly. Deke, to my immense relief, was supportive. In his brief, precise way, he told me that if there was no funny business going on, and if it was just that Pam and I were splitting up, then he had no problem with it. "Keep your nose clean, don't get into a public squabble, and keep it out of the newspapers," he told me, "and you'll be fine." That was all he said, and all he needed to say. I knew that Deke would be true to his word, as long as I was true to mine.

I also needed to talk with Dave Scott, which was equally nerve-wracking. He was a straight-arrow guy, who I feared might frown on a divorce. I never wanted to give him any reason to think less of me, either for my work or my personal life. But, like Deke, Dave was supportive. He soon proved that he would protect me on this particular issue.

There was a neighborhood party going on right after my divorce became official, and I heard that some astronaut wives didn't want me there. I talked to Dave about it, and told him, "I am not sure I want to go, because I don't think some of the wives are really happy about my divorce. I think it is because if I can go through a divorce and everything goes alright for me, they are going to think, 'Oh, shit, I'm next.' Their marriages might be in jeopardy, too. It could happen to them."

Dave sat me down, and with the calm words of a born commander said, "Al, you cannot let that bother you. You go to that party, you look them in the eye, and just be yourself. The worst thing you could do is not show up." Dave was right. I went to the party and was glad I went.

A couple of the wives continued to disapprove of me for years. One of them was Deke's wife, Marge, which was always a little frightening, because I imagined Deke hearing all about it when he was at home. And yet, over time, the wives came to understand that I was no threat to them, and in fact Marge eventually became one of my biggest advocates.

When Pam and I split up we took apartments across the street from each other and sold our beloved home. We now lived even closer to the space center than before: I only had to come out of my front door, walk one block, and I was at NASA's front gate. The kids came over to stay with me on the weekends, and seemed to do fine with the separation. In many ways, nothing much changed for them, as I had always been away during the week. Pam was well liked by the other astronaut families and stayed in town, but she left the astronaut family circuit. That was, after all, what she had wanted to get away from all those years.

The divorce had been smooth and civil, with no allegations of wrongdoing, and little in the papers. It seemed that I hadn't disappointed Deke or Dave, because events moved very quickly after that. Apollo 12 flew in November 1969. The next month, my divorce was final. And about a week later, Deke called us into his office and told us that we were going to be the prime crew for Apollo 15. We had to wait until March of 1970 for an official, public announcement. It was possible the decision could have been reversed in that time, but it never felt like that would happen. Dave, Jim, and I were elated. This was the big one. We were in. We were going to the moon.





## CHAPTER 6 UNVEILING THE MOON

A funny thing happened when Pam and I divorced. It seemed that once she didn't have to worry about me dying in a jet or in space, we could be friends again. Living across the street, with our kids going back and forth between us, our interactions became easier and more relaxed.

As a newly single astronaut, I think people assumed that I would burn through women quicker than rocket fuel. Astronauts were like rock stars back then; groupies were everywhere, and you could take your pick. Friends advised me not to jump back into a relationship and a second marriage, but to take the time to sort out my life. The same well-intentioned friends tutted that it was a shame about Pam: she would probably never marry again.

And yet, a couple of months after our divorce, Pam came over to my apartment and introduced me to her new boyfriend. His name was Jim and he liked to work a nine-to-five job, come home, put on his slippers, and smoke his pipe. The day Pam brought him over, Jim and I sat and talked all afternoon, laughed, and got on great. She called me the next day, telling me that she couldn't handle how weird it was, her new boyfriend and her ex-husband getting along so well. She didn't allow him to spend much time with me after that.

Pam had found happiness at last; she and Jim married within a year. On the other hand, it was a long, long time before I married again. Although I will always regret that my marriage to Pam did not work out, once it ended I saw I never could give her what she needed in life. She wanted stability and comfort. That wasn't me.

My new apartment was small but suited me just fine. I put up with jokes about my "bachelor pad," but in truth I worked so much that I was hardly ever there. It was more of a community apartment for visiting friends and family members, plus a host of secrecy-minded married astronauts who sometimes asked to borrow my key. They likely saw more action in my so-called bachelor pad than I ever did.

First, I had to furnish the place. All of the family furniture went to Pam in the divorce, so I started from scratch. I found a couple of interior decorators in town, who decided that a newly-single Apollo astronaut needed a hip black-and-white fiberglass sofa with black cushions, and a grand piano. They covered and constructed almost everything else from silver Mylar and glass. Even my bed, surrounded by black-and-silver walls, had a Mylar canopy. A thickly-carpeted circular staircase dominated the place. Although very hip for the time—in truth, too hip for me—it was a little too edgy for comfort. But I was amused by the buzz in the papers and magazines, which appeared to be more excited about the single astronaut and his "spacey" apartment than I was.

If I needed a reminder of the dangers of my job—and I didn't—one came right after our formal announcement as the Apollo 15 prime crew. Just a month later, in April of 1970, Apollo 13 launched.



It was the third manned lunar landing. That was the plan anyway. I had my own mission to train for now and wasn't involved at all in Apollo 13. I was sitting on my spacey sofa in my apartment watching TV two days after the launch when Jules Bergman, the ABC channel's space commentator, interrupted the show with a news flash.

I listened to his hurried report with alarm. I thought I heard Bergman report that there had been an explosion in the spacecraft en route to the moon, and the crew only had three hours to live. It was a confusing, shocking moment. What the hell was going on?

I sped over to mission control, a block away, joined a growing crowd of other concerned astronauts, and quickly learned that although the crew had escaped to the lunar module and had enough oxygen to survive for a short time, they were losing spacecraft power fast. It still wasn't clear what had happened to the command and service module, but it was something bad.

The command module pilot on the flight was Jack Swigert. I knew him well, of course, from our intense collaboration on spacecraft emergency procedures following the Apollo 1 fire. He had been the Apollo 13 backup command module pilot until just a couple of days before launch. After a possible exposure to German measles, NASA pulled Ken Mattingly from the prime crew. Jack took his place, demonstrating why backup crewmembers must always be fully prepared. Jack was prepared. But now he was aboard a crippled spacecraft alongside Jim Lovell and Fred Haise, speeding toward the moon.



Jack had had little time to practice the mission with his two new crewmates, but it didn't matter much once the flight plan was scrapped. The mission was now to get home alive, and for that task Jack needed to know the spacecraft systems inside out. I was completely confident in his hard-earned knowledge of the command module. But the situation was dire, and my heart was still in my throat. Would I ever see my good buddy alive again?

We still didn't know *why* it had happened, but mission control worked out that an oxygen tank must have exploded in the service module, damaging vital equipment. They quickly canceled the moon landing and pressed the lunar module into service as a lifeboat. The command module had lost its primary source of power in the explosion, and yet it was the spacecraft with a heat shield and parachutes. So the crew had to hang on as long as possible in the lunar module while they rounded the far side of the moon and swung back toward Earth. Then they would need to power up the command module just long enough to attempt reentry. So many things had to go right for the plan to work that I didn't know if Jack, Fred, and Jim would make it. Both spacecraft would be pushed far beyond their design specifications.

Using the spacecraft simulators in Houston, we hoped to give the crew as much help as possible. We simulated and tested huge numbers of possible survival procedures. This had to be done fast, so we split the jobs between astronauts. I helped Ken Mattingly, Joe Engle, and Stu Roosa while they simulated the flight in both the lunar module and command module. Mission control hurriedly wrote procedures and raced them over to us. We'd test them, make changes, and run them back, over and over, until they were as good as we could make them in the small window of time the crew had left.

The trickiest simulation work was in the lunar module, the spacecraft the crew relied on the most. Designed to land two astronauts on the moon, the lunar module now needed to keep three people alive for a journey around the moon and back. Its engine also had to keep them on course. To fly a straight thrusting maneuver, one astronaut would have to think in terms of up-and-down motion, while the other needed to think sideways, just to keep from veering off course. The thrusting maneuvers had to be done manually, because the lunar module's computer was not designed to calculate maneuvers with the extra mass of an attached command module. It was tough to simulate, completely backward to our prior training, and for three cold, tired, and hungry colleagues in space it was even tougher.

When I first heard the TV announcement in my apartment, I thought the crew had no chance; Jack, Fred, and Jim were going to die. But when we started testing the procedures I began to see that although it was a long shot, we might get the crew back. It still felt like a long shot until they swung around the moon and started home. It was then a question of whether the crew could survive long enough in the lunar module.

Without any power, the LM became painfully cold. Fred Haise felt increasingly sick as the days went by, and we were powerless to help. The three guys just had to endure. But we could help them find a way to keep the air-purification system working. The lunar module was not designed to keep three people alive for so long, and the canisters designed to purify the air in the command module were the wrong shape. Astronauts, mission controllers, and equipment specialists huddled together and quickly devised a way to jury-rig a system using materials we knew were on board: cardboard, plastic bags, hoses from spacesuits, and lots of duct tape. This hastily invented contraption allowed the command module's square canisters to work in the lunar module that used round canisters.

As the flight progressed, I became increasingly impressed by Fred Haise. A great pilot and a very

smart guy, his lunar module knowledge was vital to their survival. Now we had to hope the explosion had not damaged the command module's electrical system. Once the crew floated back into that spacecraft and undocked from the lunar module, they only had a small amount of battery power for reentry. The crew could not use those batteries until the last moment. The team in Houston wrote an improvised timeline so the crew could quickly power up a cold, dead spaceship using only that tiny power supply. It all had to happen very quickly at the end of the mission.

Six brutal days after liftoff the crew made it safely back to earth, with a splashdown watched around the world almost as intensely as the Apollo 11 moon landing. Once I saw those main chutes fully deployed and knew that the crew was safe, I could join the cheers and celebrations.

We'd just had a major spacecraft failure that nearly cost us a crew. My own flight was only two missions away. It was evident that Apollo 15 wasn't going to the moon any time soon—at least until we worked out what had caused the spacecraft explosion and fixed the problem. I didn't have time to dwell on it. As far as our crew was concerned, our moon mission was on. We'd have to wait longer while the service module was modified, but we could use that time to train even harder. And boy, did we have some tough training ahead of us.

However, the Apollo 13 emergency wasn't the only event in the spring of 1970 that threatened to delay our flight. A routine NASA physical revealed that I had a small abdominal hernia, and the doctors recommended surgery. Any medical condition when you are on a flight crew always results in a few sleepless nights.

NASA quickly set up an appointment for me at a hospital in downtown Houston. I stayed there for two days, trying to figure out how long it would take to get back to playing handball, my favorite sport. The day after the operation, a nurse showed up in my room with a wheelchair, asking if I'd like to tour the hospital. If anyone would be wheeled around, I replied, it would be her. She called my surgeon for support, but he told her to let me do whatever I wanted. So I gleefully pushed the nurse around the hospital. My recovery did not take long, and soon I was back playing handball. To my immense relief, the successful surgery did not affect my flight standing at all.

As we trained, and I came to know my crewmates even more, I discovered something I didn't previously know about Jim Irwin. He was happily married—to his *second* wife. But Deke didn't care about Jim's fleeting first marriage, which had ended long before he came to NASA, and why should he? It created no drama, no publicity, and no impact on his work. If Jim's divorce had made it into the papers and tarnished NASA's reputation, Deke would have acted differently. Nevertheless, I was amused that for all of NASA's worries about public perception, it managed to fly *two* divorced astronauts on Apollo 15. And that fact never made the press. But then, Jim and I weren't playboys.

As a prime crew, we were allowed a lot more time in simulators than we'd ever been able to scrape together as a backup crew. It felt like I spent half my life in an Apollo simulator in those years. I probably worked in them for about fifteen hundred hours over a two-year period. The outside world, its problems, and personalities, shrank away to nothing as we gave all of our efforts to months of intense training.

Our command module was in Downey, of course, so we spent a lot of time there. Soon, one day melted into another. We'd work all day, then go over to the athletic club in nearby Long Beach and play handball with guys who were at least twenty years older. They beat the hell out of us, but at least we would get a good workout. We would have a beer, go back to the hotel, sleep, get up, and do it all over again. The schedule was not glamorous stuff; in fact, it could be extremely tedious.

I'd love to tell you that preparing to fly to the moon was always exciting and interesting. Frequently, however, it wasn't. Much of our work was detailed testing, and we would work through

the day minute by minute. In a test procedure, for example, we were told to flip a particular switch, and then wait ten minutes for the engineers to analyze what happened when it came on. Then we'd be asked to turn it off, flip another switch, and wait again. With hundreds of switches and circuit breakers in the spacecraft and thousands of different switch combinations, this process took a very long time.

Astronauts didn't need to be there for these tests, and when we weren't available, the engineers and technicians did it themselves. But I believe our presence had a tremendous psychological impact on the Downey workers. We made it our business to know all the technicians who worked on our spacecraft and implored them to tell us if they came across any problems. Over time we developed a great rapport, and eventually, when I walked in each morning, they gave me little hints about something I might want to take a look at, which we could then fix together. Working as a team, we caught things that might otherwise have caused an issue during flight.

Fortunately, we were not stuck doing spacecraft testing week after week. We planned to explore the moon, so we needed to know something about where we were going, which meant we had to become experts in geology. Dave Scott felt that the Apollo spacecraft engineering would be pretty tried and tested by the time we flew, so now we could devote more formal training time to science. We would not be test pilots this time: we would push the technology to its maximum potential.

Geology was far removed from test piloting. Yet we weren't starting from scratch; we'd been studying the subject since joining NASA. We began primarily in the classroom and over time probably earned the equivalent of a geology college degree. I have to say, however, that the classroom work was as dry as dust, and I had a hard time keeping up with it.

We cataloged rocks in those classes and learned to recognize varying types, such as the differences between volcanic and sedimentary rocks, and how they came to be in the places where they were found. I learned that to be a true geologist, it was not enough to simply memorize what different examples looked like on sight. To really understand them and learn their secrets, we needed to get samples under a microscope and study them in greater detail. I found that the stories those samples told could be dramatically different. The rocks could have been hurled out of volcanoes, exposed and worn by erosion, folded by tectonic forces, or laid down at the bottom of a lake—there were thousands of intricate possibilities.

We wouldn't have the luxury of microscopes on the moon, however, so we never fully studied all of the diverse peculiarities that true geologists find. Instead, our crew would identify lunar rocks by eye and examine large lunar features based on what we could see and photograph from lunar orbit. The rock samples could be analyzed by trained geologists once we returned from our mission. We'd have to choose good examples for them.

The dry training style our teachers used in the classroom never really gripped me, but my attention picked up when we started to make geology field trips. To be out in the wild landscape made a huge difference. We hadn't been out of the classroom much in our first year at NASA, but now, instead of learning on a micro-level in the classroom, we studied huge expanses of terrain. I loved the feeling of being out in the field and so, it turned out, did my two Apollo crewmates.

We'd head to parts of the Rocky Mountains and survey the dramatic landscape. I would find sedimentary rocks on slopes, then hike across valleys and find the same type of rock on another slope, many miles away. From this exercise, I could understand that these rocks had been formed next to each other in flat, watery environments, and then volcanic eruptions, earthquakes, or tectonic plate movement had thrust them up and away from each other. By looking at the rocks and the landscape, we could reconstruct what had happened as if the landscape were some giant, complex puzzle.

Fieldwork was frequently hard work, both physically and mentally, but it was fascinating. Soon I could not only identify rock types on sight, but also explain the processes of their formation, and why they ended up where we found them. I could have happily pursued a career in field geology as readily as piloting.

The geologists who taught us were trying to prepare us to study the moon. The irony was that many of them disagreed profoundly about how the moon's features were formed. For every geologist who said the moon's craters were mostly formed by volcanoes, there was another who believed they were created by meteor impact. Being trained by experts who disagreed made our field trips even more interesting, and it caused me to have an open mind about what I might see when I did get up there. We would sit around the campfire in the evenings on our field trips, astronauts and geologists trading theories back and forth.

Our campfire conversations were greatly enlivened by vodka. We started a tradition of always taking a bottle or two on these trips, and our favorite was a Mexican brand called Oso Negro. It was very good—so much so, that as our flight grew closer, we joked about trying to smuggle a bottle aboard.

Listening to all the big questions the geologists traded around the campfire, I hoped that when I flew I'd be able to give them some answers. To do so, I needed to know what to look for. On these trips, I learned that when a volcano erupts the process is nothing like a meteor impact. So different, in fact, that it should be evident when studying a crater up close. When a volcano erupts, new material is blasted out on top of the landscape, so new rock is on top of old. With a meteor impact, the surface is blown upward and outward, folding the lower layers of ground on top of the upper ones, so old rock is on top of new. I was looking forward to trying to identify these features from low lunar orbit, while my colleagues did an even closer study on the moon's surface.

We traveled all over the world to study as many moon-like geologic regions as we could. I spent around ten days exploring the volcanically active regions of Iceland, a place so stark and barren I felt as if I were already on the moon. Natural hot springs, warmed by underground lava, dotted the landscape. We had a wonderful time studying the rock formations, the volcanic fields, and the general topography of the island. It was a bizarre place; we were there in the summertime, and it seemed like the sun never set. You could be out at 3 a.m. and see people strolling the city streets, the stores still open.

All of us in the NASA training team assembled to have group pictures taken with the country's prime minister. Since we were training out in the field, he flew in especially by helicopter for the photos; the country was very proud to have us there. After what seemed like dozens of photos taken, we were about to finish when one of our guys called out to stop. He had noticed that the photographer forgot to take the lens cover off his camera. We all had a good laugh about it and then retook the pictures. I'm glad we spotted the problem, otherwise there would have been one annoyed government leader—and a photographer out of a job.

NASA also sent us to explore Alaska, home to valleys of fumaroles that steamed scalding gases into the cold air. Our planet is a living, changing, dynamic place, and learning this amazed me. We also tried to have a little fun. Brooks River was a favorite spot to enjoy the state's outstanding natural beauty. We were there in the salmon-spawning season, with fish so thick that it looked like we could walk across the river on their backs.

But we were not the only salmon hunters there. Dozens of brown bears were in the river gorging themselves. They were not afraid of people; in fact, one night we had a bear come by, stand up straight, and clean his claws on the roof of our cabin. His front claws must have been thirteen feet off

the ground. We treated the bears with a great deal of respect.

We decided to head upstream away from the bears, where there were trout. We found a natural log dam about a quarter of a mile from our camp, and my old officemate PJ Weitz wandered up there as often as he could, wearing enormous hip waders and carrying his fly rod. He was fishing alone on a gravel bar in the middle of the river one day and noticed the water was deeper in front of him, so he began to walk backward to remain in the shallower water. He thought he heard a grunt behind him. Turning around, he found himself twenty feet away from a huge brown bear. Remembering his father's advice about what to do if you encounter a bear in the woods, PJ waved his arms and yelled, trying to scare it off. The beast responded by making a threatening, throaty roar back at him. Evidently it wasn't scared.

Cursing his father's advice, PJ wheeled around, as the bear continued its roaring, and tried to run across the river, which was almost impossible to do in hip waders that soon filled up with the icy water. But PJ managed to make it to the riverbank, creating a hell of a wake. We were sitting at the camp chatting when he came sloshing around the corner, his waders still spraying water. He was such a hilarious sight that we could not help but burst out laughing.

We later presented PJ with a small bear statue for providing us with so much entertainment—but in truth, he had had a narrow escape. Luckily, the bear had not been too interested in him and never took chase. Presumably the fish looked more appetizing than poor old PJ—and NASA didn't have to announce another astronaut death. It was one thing to say that an astronaut died in an aircraft; it would have been quite another for NASA to announce that an astronaut had become bear food.

We also explored regions in Mexico, California, New Mexico, and the majestic volcanoes of Hawaii. It was a magical experience to walk across the throats of active lava flows in the early Hawaiian morning, as steam rose from cracks in the fresh rock. The surface was solid, but broken into an otherworldly mosaic of polygonal shapes. When I looked down into the fissures, I could see the red-hot glow of molten rock. The areas we walked over were gradually rising into a dome, and not long after we were there they erupted into a fresh lava flow, which made us appreciate how fast some natural features can change.

Other places that we visited had their own special majesty. We explored ancient lava flows in Oregon that looked like expanses of jagged black glass, more alien in many ways than the moon. We journeyed to Meteor Crater in Arizona which is, as the name suggests, a huge impact crater in the desert east of Flagstaff, with all of the classic signs of impact-crater land folding. By sampling down through the debris left on the crater rim, and seeing if the top layers were older or younger, we practiced techniques that could be used on the moon to differentiate volcanoes from impact craters. For comparison, we'd visit calderas in Texas and see how volcanic lava could create a crater that on first glance looked quite similar to an impact crater.

If I hadn't already been awed by natural wonders, the long trek down to the floor of the Grand Canyon would have done the trick. Almost a mile deep, the steep cut carved by the Colorado River exposes layer upon layer of geological history, going back millions of years. Hiking down from the top of the canyon rim, we examined the layers of rock all the way down to the primeval crust. The experience taught us little about the moon. Nevertheless, it exposed us to more geological processes and examples. We were better prepared, because we were seeing things in context, a whole awe-inspiring mile of context.

This sense of context was particularly important for me. I already knew I wouldn't be walking on the lunar surface. Instead, when I made my flight, I would have an incredible view of the grand sweep of lunar features from only a few miles up. I would be looking at the big picture, and that could often

tell us much more than standing on the ground in one place.

We were fortunate, in a way, to have the extra time to train because of the Apollo 13 crisis. And yet the delays also concerned me, because as time went by, the more it seemed that the remaining Apollo missions came under threat. One lunar landing mission had been axed just before Apollo 13 flew, and in September of 1970 two more were cut from the roster.

The American public was losing interest in Apollo, even as NASA grew in confidence and carried out some amazing lunar exploration. People would ask me, "We landed on the moon once on Apollo 11, so why bother doing it again?" NASA had flown missions repeatedly, and they had been generally successful. When you do that often, people lose interest.

Strangely, the rest of the world still seemed fascinated by Apollo's continued explorations. They bought into the concept of Apollo 11 being just a first step and loved the idea of extended explorations on the moon. But back at home, interest waned sharply. The American public thought if they had seen one moon flight, they had seen them all. We astronauts knew how exciting and important our missions were, but it was hard to convey that to the nation at the time. With public enthusiasm for the space program fading, NASA quietly scaled back its plans.

For their part, many NASA managers did not resist cutting missions. They needed the money, they said, to develop the space shuttle. I also believe there was another unspoken reason: all Apollo flights were risky, and Apollo 13 had been riskier than most. But the crews always made it back. It was only a matter of time, our bosses fretted, until we lost a crew in flight. Thus, at the only moment in history when humans had the chance to explore the moon, with the spacecraft and rockets already built and paid for, we abandoned great plans and missions before they ever had a chance.

I was personally saddened, of course, as I watched my chance to command a lunar flight slip away. My goal had been to rotate into an Apollo command position after Apollo 15, but as they canceled more and more missions, I could see there weren't enough flights left for me to have a chance. Unless I waited for the space shuttle, I realized Apollo 15 would probably be my only spaceflight, and that realization made me more determined to make this flight perfect.

Although I was completely focused on my flight, I didn't live like a monk. I dated when I had time. It wasn't always easy. Fresh from my divorce, I had little interest in a long-term relationship, yet I knew I would always be a one-woman guy at heart. I didn't want to get too tied up with one person, but I hated the idea of wandering into a bar to find some friendly but meaningless companion.

It was usually easier to stay single or to stick with longtime, trusted friends where I could just be myself. I especially trusted and liked Beth Williams, the widow of astronaut C.C. Williams. The little free time I had was usually spent with her and her daughters, cooking meals at their home and going waterskiing. She was an anchor and a comfort in a hectic time.

I knew that I always needed to be careful with my personal life. As the flight grew closer, I continued to keep my nose clean and out of anything that could get me into trouble with my bosses. I wasn't going to give them any excuse to pull me from the mission. I also took the time to think more about what had happened to Donn Eisele. In retrospect, I decided, Donn had provided me with a great lesson in what *not* to do.

I'd been sitting in my office in Houston one Wednesday afternoon in the summer of 1969 when Donn came by to talk. He had just divorced his wife, Harriet, the week before. And now he was asking me if I would fly down to the Cape with him the next Saturday and be the best man at a quick wedding to his longtime girlfriend, Susie. I thought he was nuts. "Donn," I told him, "I can't believe you are getting married right now. You just got your divorce, and you are jumping right in again?"

I told Donn he should slow down and think about what he was doing. Don't make any decisions for

at least a year, I suggested. If she is the right woman, I said, she will still be there in a year's time. Donn, however, didn't want to listen.

As it turned out, Donn made the right decision when it came to his own personal happiness. He and Susie had a loving and successful marriage that lasted until the day he died. But professionally, he was shunted to the sidelines and never flew a mission again. I was relieved that my divorce had been much quieter and simpler, and as my flight neared I tried not to do anything that might put me in a bad light. With Dave Scott as my commander, I felt I had a good mentor, and I'd be safe while the Apollo flight opportunities dwindled around us.

The NASA cutbacks meant the remaining missions really had to count. The lunar landing missions before ours were known as "G" and "H" missions and were simpler. Our flight, the first of the "J" missions, was significantly more daring. Dave and Jim would spend three days on the lunar surface, twice as long as anyone before. They would spend much longer outside the lunar module exploring the surface and even take an electric-powered car, called the lunar rover, to speed the journey to interesting sites nearby.

Instead of exploring the relatively safe lava plains near the equator like previous missions, our mission planned to land well north of there. Dave and Jim would need to drop over a steep mountain to land next to a distinctive feature called Hadley Rille. As our mission time was stretched, NASA reworked the lunar landing equipment to enhance its performance. Our lunar module had a better engine, bigger fuel tanks, an improved power supply, and was significantly heavier than earlier models. The spacesuits were also improved: they were more flexible and could endure a longer time exploring the surface.

We were delivering more than President Kennedy had ever asked of Apollo. We were really hitting our stride and showing NASA's full potential when it came to lunar exploration. After the dangers of Apollo 13, there would be one more of the simpler lunar landing missions: Apollo 14 would carry out the mission Apollo 13 failed to complete. Then we would take Apollo way beyond its original intentions. It was a strange irony, however. Right as we grew in confidence and potential, budget cuts were chopping the program out from underneath us.

Our crew felt ready to take on the extra work of an enhanced mission. Not only did we have extra time to train because of the delay after Apollo 13, but we had already been training together for several years. We had an edge. Dave, Jim, and I were already confident in our ability to fly those spacecraft. In fact, as a necessity, we overtrained. We spent a lot of time practicing all of the malfunctions and problems that might happen during a flight.

In the simulators, our training instructors would repeatedly take us through all of the major moments in a mission. The simulator game was just that—a game, with astronauts on one side and the operators on the other. The first couple of times, the instructors gave us a free ride and allowed us to fly as if everything was normal. Then they started to throw simulated malfunctions at us. They hit us with more and more crises until it all got a little crazy. Just as we finished one procedure, they hurled another malfunction at us. Our crew tried to solve multiple problems at once, and the first few times we killed ourselves. The malfunctions overpowered us, and we crashed and burned. That was the beauty of a simulator: we could die and still walk away to try another day.

Whenever you fly in space, the potential of death is always there. There was always the possibility that I might have to return from the moon alone. If something went seriously wrong on the surface for Jim and Dave, then it would be my only choice. I'd have no way to save them. It was something we never discussed, either as a crew or with the trainers. We didn't have to; I trained to make the same spacecraft maneuvers to return to Earth whether I was on my own or not. Nevertheless, we all knew it



was an unspoken possibility. We did train for other rescue options, where I would do everything possible to rescue a crew in trouble. If Dave and Jim were able to launch in the lunar module but were stuck in a crazy, eccentric orbit, I was trained to find a way to dock with them and rescue them if I could.

The intense training taught us that in a spacecraft you don't do anything fast. Only a few things, such as a hole in the side of our spacecraft, required really quick attention. At that point, we would do something *very* fast. So we focused on the events that could kill us and prepared for them. We instinctively memorized the actions to take, knowing they could save our lives. If a problem were not immediately life-threatening, however, we would get out our malfunction books, methodically go through them, and follow the procedures. By the end of the training we'd memorized most of these procedures, too, but we still pulled out the books, just to double-check ourselves.

Gradually, we learned to take emergencies in stride. The more we trained, the more we instinctively knew what to do when something went wrong. Although the training was still insane, we got on top of it and in control of it, so there was far less excitement when a red warning light came on. We trained for disaster. A normal flight should be a piece of cake.

The public, of course, only saw the end result: our flight in space. A good equivalent would be watching a football team play a game or attending a concert by a noted pianist. In both cases, you see the well-practiced finale. What you don't see is the backbreaking hard work and the endless training it takes to get to that level. When the time came to give our performance in front of the world, we would be as polished as athletes and musicians on their big day.

Our mission could not afford to fail. We knew that many in the scientific community were distraught that the Apollo program was being scaled back just as it reached its full scientific potential. We also understood that we would be pleasing the scientists we worked with by performing more experiments. Yet that wasn't our main reason to do the experiments. The pressure to carry out more science came strictly from within our crew. I not only wanted to do as much as possible personally, but also I never wanted Dave Scott to be in a position where he could say I wasn't doing my job. Dave was becoming increasingly fascinated with geology as well and piled on his own share of science tasks to attempt. He and I became quite competitive in our scientific preparedness and the number of experiments we planned to fit in. Compared to prior Apollo flights, we really loaded ourselves up with chores.

I think a little bit of competition between us was a good thing. It was an extra incentive for us both: I wasn't going to let anything get by me, and neither was Dave. We didn't necessarily have to love working with each other to make a good team. In fact, the competitiveness made us do more. With Dave, I never felt I could say, "I'm a little tired. Can we stop for today?" I was not going to put myself in that position with him, and that working relationship made me do more than I might have done if I'd had a close buddy for a commander.

We accepted more and more science experiment proposals for our flight plan. If everything went smoothly, we'd end up doing more science than any other Apollo mission. Our philosophy was that it was easier to accept a proposal and then not have time to do it in space, than to add a new experiment during the flight. We jammed the flight plan with tasks.

Originally, I expected that during the mission we'd have to throw out some plans as too ambitious. As our launch date grew ever closer, however, I realized that neither Dave nor I would scratch a single science experiment. We'd become so competitive, we didn't dare. We were a little overloaded and were going to be busy every second, but Dave and I would do all of the experiments because that was the kind of relationship we had with each other.

We had taken our geology training seriously. So seriously, in fact, it made me wonder what Deke Slayton thought. Deke was not a science kind of guy. He was a pilot through and through and didn't care too much about rocks. Nevertheless, Dave submitted our training program to him for approval. Whatever his personal opinions, Deke agreed to everything we asked for. If he had any concerns about the amount of science we planned on top of all the piloting, I never heard it.

In the meantime, other engineers prepared the equipment we'd use for this ambitious flight. Although I wouldn't be driving it myself, I found the work on the lunar rover fascinating. The rover was designed to address a fundamental need: without some kind of vehicle, astronauts would not be able to explore as much of the moon's surface. But the rover wasn't the only design that had been put forward.

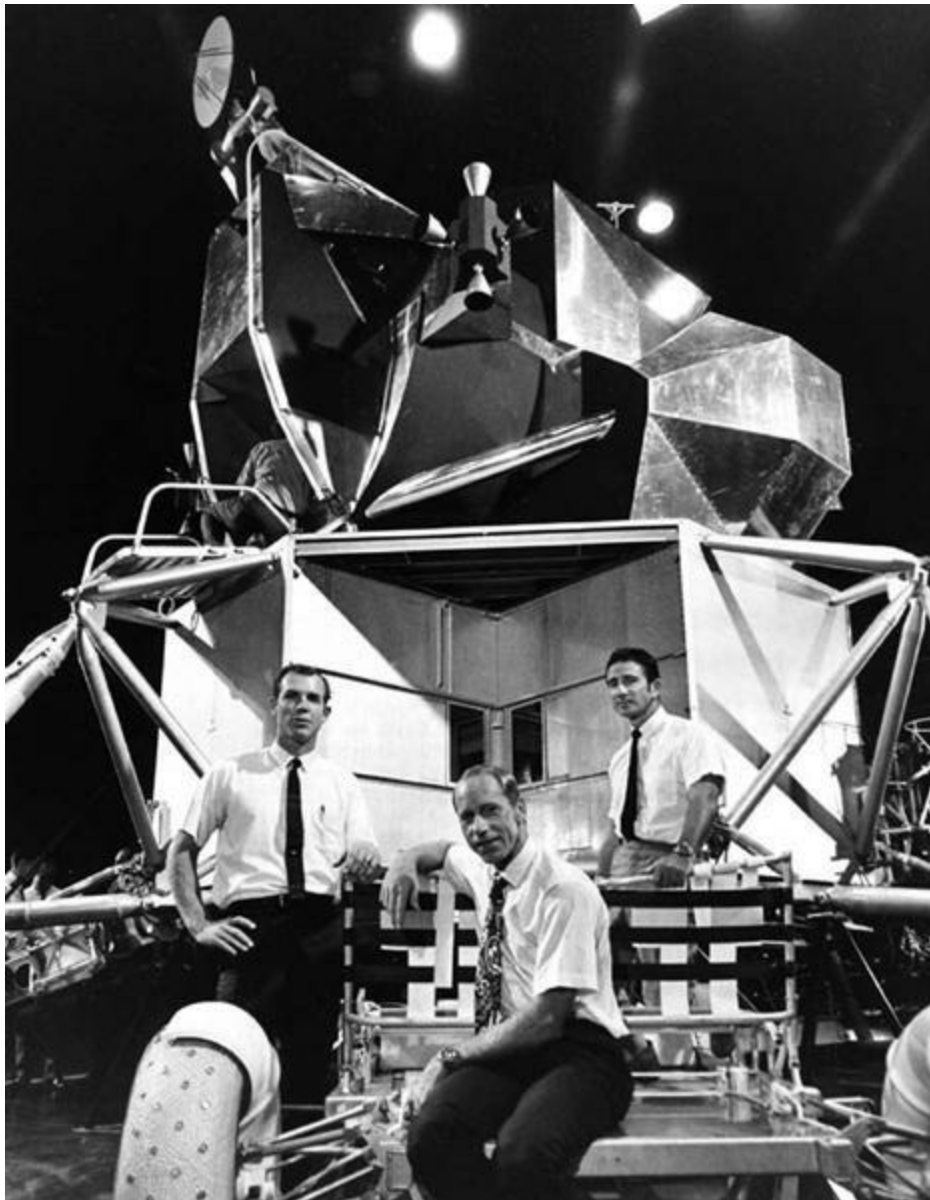
During one of my visits to North American Aviation, I remember talking to some of the engineers over lunch, and they mentioned something fun they had out on the backyard that I could try if I wanted. When I agreed, they took me to the most bizarre flying vehicle prototype I had ever seen, a small, flat, circular platform, with a four-foot pole sticking out of the top. On the top of the pole was a set of bicycle handles, looking a little like a pogo stick. The engineers put me in a protective suit, strapped me into a safety harness, then asked me to stand on the platform and grip the handlebars. They quickly explained that one handle had a throttle control, and when I twisted it I would activate an air hose that blew down at high pressure from under the platform, counterbalancing my weight. It would probably be unstable, they warned me, so the harness was there in case the platform started to tip over.

I turned the throttle control and, wow, that thing was a kick! It took a lot of getting used to, trying to balance on a carpet of air as I revved it up and slithered and shimmied around. The vehicle was possible to master after some practice, but it took skill. With no control system to keep the platform stable, I had to use my natural instincts to stay upright. It was tough but great fun to fly.

Sadly, it was just a rough prototype of an idea, and nothing like that ever flew to the moon. It would have been a great experience to fly over the lunar surface surveying large areas much faster than walking would allow. But the budget cuts that whittled away the Apollo program meant NASA abandoned ambitious plans such as lunar flyers. Fortunately the lunar rover idea survived, although in a stripped-down, basic version of earlier designs. We also had to wait until the end of 1969 for the green light to develop and build the final version.

The Boeing Company had only about eighteen months to design and build the first car to drive on the moon. It was a crazily short amount of time to come up with something so innovative, especially since the lunar rover needed to fold up like a pretzel on the side of the lunar module for the journey to the moon's surface. When it reached the moon, the rover had to be unfolded again and ready to drive in a short amount of time. It amazed me how fast Boeing came up with a working vehicle.

But not everything went smoothly. I distinctly recall one time that Boeing was having a real problem getting the rover's electrical system to work. Fortunately, General Motors was Boeing's prime subcontractor for the vehicle, and the astronauts had some great contacts within that company because of our Corvette deal. On this occasion a discreet phone call was made to Ed Cole, the president of General Motors and a good friend, describing what was not working. He immediately understood the seriousness of the problem and what needed to be done. The prototype car underwent some General Motors tests that Boeing may not have thought to do, and soon afterward the problems were fixed. Although NASA managers generally frowned on astronauts being cozy with the captains of industry, on occasions like this our personal relationships helped move the program forward and cut through a lot of red tape.



*Our crew with full-size mockups of the lunar rover and lunar module*

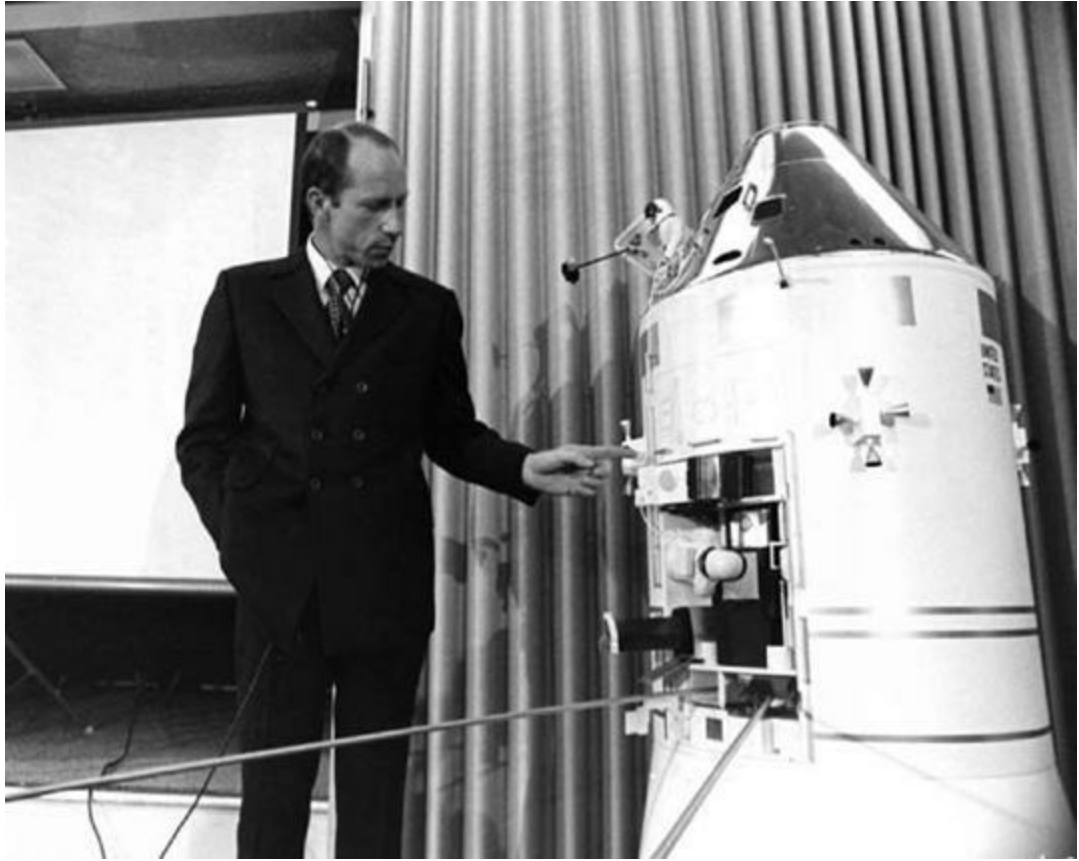
But the rover was of more concern to Dave and Jim. They would be the ones driving it on the surface, so they spent a huge amount of time together training with it. There were other new pieces of equipment that directly affected me, and I wanted to focus my time on them instead.

The Apollo service module had been modified after Apollo 13 to make it much safer. I'd had a number of conversations about it with Jack Swigert, while the engineers and technicians tried to work out what had gone wrong on his mission. Jack had followed the flight plan to the letter, and yet an oxygen tank had exploded. The two of us had worked hard on the spacecraft's malfunction procedures, so we were concerned that a normal procedure might somehow have caused the damage. It was almost a relief when we learned the oxygen tank had an undetected flaw: an easy fix. There was nothing that Jack could have done to prevent the explosion.

For Apollo 15, there would be even bigger changes to the service module. While I orbited the moon alone, I would operate an entire bay of instruments built into the side of the service module. We called it the SIM bay, or Scientific Instrument Module, and it contained a huge amount of scientific equipment to study the moon in great detail. For example, I would have two different cameras to extensively photograph the surface. A high-resolution panoramic camera would take long, thin photos,

capturing objects as small as three feet on the lunar surface while I flew overhead. I also had another, wider-range camera that I could use to help cartographers create a detailed map of the moon. To help calibrate the photos, a laser beam would fire at the surface so we could tell exactly how high up I was, and therefore the distances and feature sizes in the photographs.

I would also have instruments that could detect gamma rays, alpha particles, and X-rays, all of which could tell us a great deal about the composition of the moon's surface. If volcanic gases were also still escaping from the moon, even in minute quantities, we should be able to measure them. When added to the photographs I would take with a handheld camera through the spacecraft windows, I would be an independent scientific laboratory, able to gather data on the moon from above like no human ever had before. At the end of the mission, I'd even get to launch a tiny satellite, which we would leave in lunar orbit to continue making discoveries.



*Explaining the SIM bay operations to the press using a model of the command and service module*

It was exciting stuff for me and for the scientists who hoped to unlock more of the moon's secrets. We were moving into far more complex areas than previous missions, doing work that at times sounded more like science fiction. Soon I would be skimming across an alien world, studying and recording it in huge detail. I couldn't wait.

I worked with the scientists who designed the SIM bay experiments and with the flight planners who integrated our activities into a flight plan with an organized timeline. We ensured that my orbital operations fit well with the surface work, not just in an operational sense, but also in a scientific sense. It would be a powerful combination: Dave and Jim collecting rocks on the surface while I recorded the chemical composition of an entire region from orbit.

This individual training meant I saw less of Jim and Dave as we began to concentrate more and more on the unique elements of our mission. The two of them spent a lot of time on Long Island

working with the lunar module, as well as practicing the activities they would conduct on the lunar surface. Even when we trained together, I was often alone in the command module simulator, talking to them in the lunar module simulator. We were probably only in the same simulator for 20 percent of the training time. That made sense, as there were only a limited number of times, such as launch and reentry, when we would work as a trio. For maneuvers, midcourse corrections, and changing our orbit around the moon, it made more sense for me to train solo.

I felt that my work was just as important as the lunar surface exploration. The rocks collected on the surface would be the ground truth, an important part of the puzzle. Dave and Jim would collect samples, identify where they found them, and take photos to mark the locations. When we returned them to Houston, those rocks could be analyzed in greater detail. We could then compare them to the data I would collect of that whole area from orbit and work out a system where the two sets of data agreed with each other. Since I would be passing over other sites where moon landings had been and would be made, we could build up quite a database of comparison. With this combination of information, we could learn about other areas of the moon without ever needing to land there. Since Apollo wouldn't land on the moon as many times as originally planned, this information would be vital to collect.

It wasn't going to be easy. As engineers and technicians finalized their work preparing the first-ever SIM bay, they constantly ran into technical problems. Some of the equipment came out from the spacecraft on long booms, and this was tough to replicate in Earth's gravity. When the instruments were turned on, the data did not always flow well. The engineers made a lot of last-moment tweaks and adjustments. I was too busy training to be very involved and just had to hope it would all be ready in time for our flight.

I was fascinated by most space science, but not impressed with one area—medical experiments. We trusted our regular doctors to take good care of us, but we did not trust the medical team assigned to the flight. They were not our regular flight surgeons and didn't have the normal doctor-patient relationship with us.

The mission doctors tried very hard to think up experiments for us to do in space, and most of them went way beyond anything we would consider. For example, they wanted to insert a catheter into one astronaut for the flight, threading it in through his veins into the heart. The doctors were curious to see how the heart worked during a spaceflight. We, of course, were horrified at this dangerous request. So we struck a deal: if the doctors could prove it was a benign test, we would consider it. A flight surgeon volunteered to do the test while riding a bicycle ergometer. After about five minutes of riding the bike, he had a heart attack. That ended that possibility.

Fortunately, we could trust most of the other professionals attached to our mission. In fact, they were the best in the world at their specialist areas. A lot of my intense training still focused on geology, and I wanted to squeeze every last drop of knowledge out of our time at the moon. Jim and Dave, along with their backups, trained with Lee Silver, who was an incredibly skilled field geologist from Caltech. It's hard to imagine a better person to bridge the gap between academic geology and the test pilot mentality. He was tough and never let up in his passion and intensity to push us as hard as he could. He would have his trainees up and about by five in the morning on those field trips because he was raring to go and explore. As well as pushing hard, he also used every trick in the book to keep his students excited and enthusiastic, knowing that he had to earn the attention of astronauts who were constantly pulled in different directions by demands on their time. He was just what NASA needed, and our expedition was immeasurably improved by his participation.

While Dave and Jim worked with Lee on what might be discovered on the surface, I studied with

one of the most interesting and memorable characters NASA ever brought into its fold. “King” Farouk El-Baz, an Egyptian-born geologist, worked for the Bellcomm think tank at NASA headquarters. He was asked to help train me and the other command module pilots on what we might see from lunar orbit. It was the happiest part of all my training, because Farouk was a vast storehouse of knowledge.

To say that Farouk was eager and into his subject is an understatement. He was, and still is, a ball of energy and fun. Dark-haired and slim, Farouk was upbeat, not hyper but most definitely a type A personality. Simply put, he made everything interesting. Even if we spent a long day working together, I never grew tired of him, because he was so good at what he did. Farouk became like a brother to me: very close and very special. After a long day of intensive work, I would still want to spend time with him, and we would go out drinking together. While Farouk tried to match me drink for drink, we’d share stories about our backgrounds. Since he had grown up in such a different culture from mine, I found his tales enthralling. His childhood stories of the Nile Delta differed greatly from my snowy Michigan memories.

Farouk’s entire office was plastered with enlarged photos of the lunar surface. The first time I stepped in there, the black-and-white random swirls and patterns reminded me of a psychedelic hippie hangout, but every photo was a learning opportunity.

Farouk instinctively understood what was ahead of me. As well as teaching me surface features, he’d also use the maps to train me to work fast. I learned to recognize and name lunar features as quickly as if I were seeing them from a speedy lunar orbit. There was little point learning them if my mind was not fast enough to recognize them. I also wanted to ensure that all of the photographic equipment I carried with me could accurately record what I saw. We spent hours going over the maps and making notes about the direction the spacecraft would need to be oriented to take the best images. It would be a complicated ballet of movement for me to fly, especially if I didn’t want to use up too much fuel. But we knew the effort would have a huge payoff in scientific return.

As Farouk animatedly took me through the trajectories I would be flying over the moon, my appreciation of the lunar surface grew. He allowed me to get to know geology by really feeling it, not just by memorizing. We studied every tiny detail of the craters and other features I would be passing over. Not only would I come to learn all of their names, but I would also understand what was special about each crater, what I needed to look for in detail, and how to describe in it ways that would help the scientists listening back on Earth. I grew more and more confident in giving these descriptions.

Although I spent a great deal of time with many scientists involved with our mission, I probably spent more time with Farouk than with anybody else. When I worked with the other scientists, I was deliberating when to extend and retract experiment booms, when to report my findings, and other operational details. With Farouk I learned how to look for things we might not even know existed.

Our study together was so different and so much more interesting than my earlier classroom geology classes, partly because of a change in me, too. Geology wasn’t just academic to me anymore. We were preparing for a real flight, where I would look up close at something that was normally very far away. That perspective put a whole new spin on it for me.



*Studying lunar geology with the irrepressible Farouk El-Baz (right)*

I grew confident that when I reached the moon I would not only know what was going by, but also what I would see next. The lunar maps began to feel as familiar as my home street from childhood. When you drive down a familiar street, you know what is coming up soon and remember details such as who lives in which house. The moon began to feel the same way to me, even before I traveled there. The moon became a friendly place.

I went on almost all of the geology training field trips with Dave and Jim, but I was overhead in an aircraft, at a height and speed that best simulated how landscape would pass below me on the moon. While Dave and Jim studied the small picture on the ground, I made observations about the big picture from above. Jim and Dave trained with the same kind of equipment, maps, and time between sites that they would have on the moon. We even brought along our mission's flight directors, so they could see firsthand what we'd have to do on the moon. This meant that they would truly understand what they would have to do to support us from Houston by radio, when we were hundreds of thousands of miles away. Our training and observations began to mesh. By coordinating what I saw from orbit with what Dave and Jim studied on the ground, we'd have a powerful combination of knowledge and observations.

Although Jim and I became very good at geology, Dave absorbed the geology training better than anybody. He didn't just know the facts, he truly understood them, which is the ultimate goal of any training. We lived it, day and night, and so the geology seeped into us all. Dave had every excuse to skimp on the subject if he'd wanted to: we had so many other things we needed to learn for our mission. But he was a true believer and his enthusiasm motivated everyone involved in the mission.

Dave's backup commander, my good friend Dick Gordon, also put everything he had into training. With so many flights canceled, Dick had little chance to rotate into an Apollo command position before the program ended. Yet I never had the feeling that he was only doing all of this work for the possibility of another flight. Dick is a trouser and seemed delighted to be on a crew backing us up. If he was sad that he would probably never walk on the moon, he never let on.

I received some additional training from the photo geologists of the U.S. Geological Survey in Menlo Park, California, and learned a good deal about how they analyzed images for information. This training helped me when learning how to take photographs. Nevertheless, for three years before the mission, I also did personal training, which helped me even more. I figured that learning to take photos was like practicing the piano: it takes a long time just to learn a little bit, but the more you play the better you become. So I carried a camera with me at all times and took photos of just about everything, trying to perfect my technique.

I was particularly interested in taking photographs at low light levels. I would often go to places such as parking lots in the middle of the night and test my camera. Even though it looked very dark to my eyes, I knew there was a little bit of glow in the sky at all times, and with sensitive film I would get a good picture. Luckily, the police never saw me lurking around in odd, dark places in the middle of the night with a camera. I doubt they would have believed my explanation.

I spent a lot of time trying to learn the best settings and fine-tuning my ability with high-speed film because of some of the difficult experiments I planned to try on the flight. I wanted to take photos of star fields that were extremely faint. It was kind of chancy that I would get anything on the film, but I would give it my best shot.

I was even hoping to pick up on film the *Gegenschein*, a faint reflection of sunlight from interplanetary dust orbiting the sun. There are also stable equilibrium points in our Earth-moon system where the gravitational pull of Earth and moon balance, and I planned to aim a camera at them. A spacecraft placed in one of these points should stay in the same place forever, unless it used its rockets to leave. Scientists believed one point in particular might gradually trap dust over time. I planned to mount a camera in the window, gently move the spacecraft, then try to keep it steady while I took photos. For an exposure as long as ten seconds it would be impossible to hold the command module completely still, and any photos were likely to be a little shaky. Nevertheless, we hoped to capture images of some of the faintest and strangest things in our astronomical neighborhood.

We didn't need pilots on our support crew; we needed colleagues who could help us with all this science. So we picked up Joe Allen, Bob Parker, and Karl Henize, three of the scientist-astronauts selected in 1967. They wouldn't fly during Apollo—they'd have to wait for the space shuttle—but they could do their part. Joe and Bob worked with Dave and Jim on surface geology and put their hearts and souls into our mission.

Karl was an astronomer, so he spent a lot of time helping with my tasks. He did a large amount of work on my experiments, kept me updated on their preparation, and checked out details. He was six years older than me, and I saw him as a crusty old guy at the time. Had I not known better, on first glance I would never have guessed he was a college professor and a highly-regarded research astronomer. Karl just didn't have the look of a sophisticated, scholarly guy. He looked far more



down-to-earth, rugged, and in good physical shape.

Underneath that crusty exterior was an extremely smart guy, who understood our mission well. I remember feeling a little sad, thinking that Karl would never get to fly in space himself. That was certainly the general opinion around the office. He was already forty-one when NASA sent him to learn how to fly jets, and the space shuttle was a long way off in the future. Time was not on his side. It was, therefore, a special moment for me when I heard in 1985 that Karl was flying in space at last, personally conducting astronomy experiments in orbit. He was fifty-eight by then and became the oldest person to fly in space at the time.

With Apollo 13's problems fixed, the Apollo 14 crew was preparing to fly. One of the crewmembers, Ed Mitchell, lived with me for a while at my apartment. He and his wife were separating, but Ed didn't want to proceed with a full-blown divorce. He was worried how a divorce might affect his astronaut career and preferred to wait until after his flight.

I liked Ed. He was different from your average astronaut. Fascinated by psychic phenomena and spiritual energy, he studied "new age" ideas that were far outside the scientific mainstream. It didn't fit our NASA work, so Ed kept his interests pretty much to himself for a long time. At my apartment, however, we'd have long discussions into the night exploring what he called "the nature of consciousness," including his plan to try ESP experiments on his moon mission.

Ed's Apollo 14 mission would set down where Apollo 13 had planned to land; NASA was investing two missions in one landing zone. We hoped their geological survey would bring new scientific knowledge to help justify the huge investment. The mission commander, however, was Alan Shepard.

Grounded for years by an inner-ear condition, Shepard had sat out most of the space program in a desk job. Eventually he underwent an operation to fix the problem, jumped back into the flight roster, and tried to grab the next available mission. NASA insisted he needed more time to train and knocked him back to Apollo 14. Although Shepard had two excellent crewmembers, I heard grouching that Al didn't take the science seriously.

Ed Mitchell and Stu Roosa, the lunar module pilot and command module pilot for the mission, were two of NASA's best. In fact, many considered Ed the most talented astronaut of my entire selection group. But a crew is guided, both in training and in attitude, by its commander. Shepard made it clear to a number of geologists that rocks weren't a priority for him.

When Al and Ed landed on the moon in February 1971, they managed an impressive amount of science work, but the rolling landscape and lack of clear landmarks could confuse anyone. They were soon lost during an ambitious excursion up the side of a large crater. As they pressed on toward the crater rim, the two of them grew tired and overheated. They had a choice: try and make the rim or carefully and scientifically document the rocks they were climbing past. They did neither. Out of time, never really sure where they were, Ed and Al no longer had the ability to accurately document and sample the hillside. They had to grab samples, snap a photo, and press on.

Perhaps the mission was too ambitious, and this was the best possible result. It was hard to understand a landing site until you were there in person. Nevertheless, the fact that NASA had launched both Apollo 13 and 14 to survey this one area, and that many geologists were understandably disgruntled by the results, made me even more determined to make our mission count.

We were now next in line to fly. We'd made it through the long training grind. NASA's attention really turned in our direction, and I felt an intense focus on preparing our mission to launch. It was getting so close, I could almost taste it. And yet, in the spring of 1971, right as we neared the peak of our abilities and readiness to fly, I made a decision that fucked up my life completely, utterly, and

irreversibly.



## CHAPTER 7 TRAINING AND TEMPTATION

Decades later, I am still angry. Upset at myself and others. It seemed like an insignificant thing at the time, when I was concentrating on flying and science preparations for the mission. But eventually it overwhelmed all the good work that we did and ruined my career.

Unlike robot probes and satellites, we were human space explorers. This human component allowed us to do more than unmanned missions ever could. However, wherever humans go, human behavior goes with them. That included the urge to take care of our own interests.

When I joined the program, I soon heard how astronauts enjoyed the perks that came with the job. The original astronauts had succeeded in selling their personal stories to Time-Life and Field Enterprises, despite the concerns of a few officials. The Corvette-leasing deal had slipped by, too. Other offers, such as free houses and low-interest loans, had not been approved—although not for lack of trying. Then there were people like Al Shepard, apparently making millions on government time, while his bosses appeared to turn a blind eye. Earlier crews had even been able to accept gifts of free life insurance, although this perk was no longer offered by the time I flew.

I also learned that this kind of behavior, using astronaut status as a way to get a little something extra, even extended to the spaceflights. As far back as the earliest Mercury missions, astronauts carried personal items that no one at NASA checked too closely. To give just a couple of examples, Gus Grissom had coins and little Mercury spacecraft charms hidden in a spacesuit leg pocket, and Gordo Cooper stuffed paper currency in his spacesuit. Wally Schirra's colleagues even tucked a tiny bottle of scotch and a packet of cigarettes in his spacecraft. Initially treasured by their recipients, over time many of these items have turned up for sale on the open market. If you have enough cash, you can buy them.

Yet I doubt money was ever the motive. I think the items were used to pull pranks, to give to family members, close friends, or coworkers who had supported the astronauts in some way. They were generally modest, almost worthless trinkets, other than their journey into space. Receiving one was a sign that you were in some kind of inner circle, with all of the unspoken affection, and trust, this gesture implied. It is a cliché, but it truly was a more innocent time.

The danger was, of course, that after flown items left an astronaut's hands, they might end up anywhere. They might be sold. NASA wasn't happy about that possibility, although they seemed to accept it was out of their control. But the trinkets came with an unspoken understanding and obligation not to embarrass the giver.

By the time I showed up, during the Gemini program, Deke Slayton had developed an informal system. Gemini astronauts could fill a tiny bag with personal items as long as he was given a list of the contents. The Gemini lists I have seen are about thirty words long, and give generalities such as

“coin, tie tack, Masonic ring, various medals, flags.” They identified no recipients.

NASA also flew its own set of mementos. Senators and congressmen always welcomed a little flown flag of their home state. Other items were gifted to museums and cultural centers all over the world, at which point NASA lost any control over them.

Dave Scott, who had already flown twice and was about to fly again, knew the drill. But Apollo 15 was my first flight, and I didn't know squat about souvenirs. NASA told me that Apollo astronauts could carry a couple of little bags in the command module called Personal Preference Kits, or PPKs. They couldn't weigh more than a few pounds in total. In addition, smaller and lighter PPK bags would ride in the lunar module, down to the lunar surface and back. Looking like little lunch sacks, the PPKs were made of Beta cloth, the special fire-resistant material also used to cover our spacesuits. The bags that went to the lunar surface had to be light; they weighed less than a full cereal box.

As I recall, our Apollo flight carried five PPKs in the command module. Dave and Jim also took bags in the lunar module and kindly offered to carry some items of mine to the lunar surface. Additionally, I had a bag of music cassette tapes to listen to.

We were not required to publicly disclose the PPK contents, and I don't know of any Apollo astronaut who ever did. In recent years, astronauts have sold a few items at auctions, so the public is discovering a little of what they took. At the time, we just gave Deke Slayton our lists. I believe Deke then told the mission director that the items met flight requirements for inflammability and toxicity and were not controversial.

It was relaxed and informal; often the lists weren't even typed up. Looking for human-interest stories, the press often asked NASA about the personal items astronauts carried. But NASA never gave them any details. I understood that NASA only cared about their weight, so engineers could properly balance the spacecraft cabin contents.

The PPKs weren't opened during the flight; they held nothing we'd need. Other personal items, such as sunglasses, combs, spoons, razors, and pens that we would use in flight were ours to keep afterward and do with as we wished. Many astronauts also stripped off little parts of their spacecraft at the end of a mission, particularly from the lunar modules that would not return to Earth.

In the middle of a very busy time when I had far more pressing concerns such as mission training, I thought briefly about what to take on the mission. To my recollection, almost everything I carried was taken for someone else. I included little items like jewelry, medallions and crosses for my kids and my ex-wife. For Beth Williams I took some jewelry, and for Farouk, some religious items. I packed a West Point flag, and University of Michigan flags and decals.

Many employees at the Cape and elsewhere, such as the space center guards, wanted to know if I would carry something for them. I said yes to anyone who asked, requesting only that the item be small and light, because I had a weight and size limit. If it reached a point where I was given too many items, I would have prioritized based on who was closest to me. But I never had to do that.

Jim felt the same way. His PPK list included little items such as wedding rings and cufflinks loaned by the flight crew support team, plus mementos for the backup and support crews. They had worked so hard to assist our flight and would already be going with us in spirit. Now they would also receive a very personal memento.

So I ended up with a bag of stuff, most of which was not mine. That was fine with me, because I didn't care too much about souvenirs for myself, nor did I have time to think about it. The idea that someone might one day want my used comb or a bit of old, worn equipment as a collectible would have made me laugh. I should have cared—I was about to get in a shitload of trouble over the items

we carried—but I didn't. I had to train. The real treasures would be the scientific results, the photos, and measurements, not old toothbrushes or mementos stuffed in my PPK.

In order to recover these scientific treasures, I had to master another crucial skill—spacewalking. I could operate the panoramic and mapping cameras from inside the command module, but to retrieve the film I needed to go outside. On the way back from the moon, I would recover the large cassettes from the SIM bay. It was an opportunity to do something historic: the first deep-space extravehicular activity, or EVA. I would float outside a spacecraft farther from Earth than anyone had ever done before. And if I didn't get it right and bring the cassettes back inside the spacecraft, we'd lose priceless pictures.

I did much of my zero-G training in NASA's Boeing KC-135 aircraft. Flying the aircraft in a shallow dive to gain speed, the pilots would then pull up in a climb. As the aircraft reached the top of the arc, the pilots would let it fall forward, eliminating all sensation of gravity inside the fuselage. We would briefly experience the feeling of weightlessness in the spacious interior, and the effect lasted long enough to perform some meaningful tests and training.

On a normal flight, we would fly fifty or sixty parabolas. One day, however, I asked if we could keep going. Dave Scott was also on that flight and kept asking if I was done. No, I wanted to try some more maneuvers. What Dave didn't know is that I had asked Harry, the pilot, to smash the world record. And we did it—we flew an unprecedented 125 parabolas.

I trained underwater, too. I'd already passed the arduous training at the SCUBA underwater school in the Florida Keys, where the military underwater demolition teams honed their skills. It taught me what to do if I were training in a water tank in a spacesuit and something went wrong. It supplemented some water survival training we did out in the Gulf of Mexico. Our spacecraft would splash down in the ocean at the end of the mission, and we'd need to know the procedures if everything went correctly, but also if something bad happened. We floated around in a replica of the command module, and worked with our recovery crew to climb out into a rubber raft and wait for an airlift. The Navy SEALs we trained with also worked with us on our actual flight. They were professional, highly competent, and after my SCUBA training I had an extra appreciation for their toughness.

But I learned more in the KC-135 airplane than I ever did underwater. Our water tank was a good place to test some procedures, but not to practice moving objects around. The engineers tried to make our training equipment neutrally buoyant, and the right size and shape, so the objects felt right and wouldn't float or sink. Nevertheless, anything we pulled through water was going to drag. We tried boring a large number of holes in the film canisters so the water passed through, but they still didn't react the same way as they would in space. We didn't have that problem on the parabolic flights.

The water tank could also be misleading, as NASA engineers discovered. They had already looked at and rejected a number of options for retrieving the film cassettes, such as a large robot arm to grab the canisters. By the time I started EVA training they had settled on a looping clothesline. I would place a pole in the open hatch. Then I'd float down to the other end of the SIM bay holding a second pole, and place it in a bracket. A looped line with clips would be strung between the two poles on pulleys; I was then supposed to clip the containers onto the line, and Jim would reel them into the spacecraft.

It worked fine underwater, but I wasn't convinced it would work in space. Although the big film cassettes would be weightless, they still had mass. I doubted Jim, or anyone else, could pull that clothesline so smoothly that the film canisters would not whip sideways as they were pulled in.

I insisted we try the procedure in the KC-135; so we created a mock-up of the SIM bay, like a lengthwise slice of the command and service module, right up to the open spacecraft hatch. Once we

were in a zero-G parabola, Jim delicately and precisely pulled on the clothesline. Sure enough, the film canisters began to sway—so much that one canister knocked a rocket thruster right off the side of the service module. The engineers agreed: we needed to find a better way.

Forget all the fancy stuff. The simplest and best way, I proposed, was to grab a handle on each canister and bring them back one by one, like carrying a briefcase. I thought I could do most of the EVA with one free hand. If I needed to let go of the handle for any reason, the canister would still be attached to my wrist with a short tether, a snap hook, and a pin. That container wouldn't float away very far.

Even better, during the training, I found that the canister handle didn't take up my whole glove, so I could still use both hands to guide myself. Hand rails on the outside of the service module would permit me to pull myself along. The motions seemed natural to me in training, and I anticipated few problems in space.

During the EVA, a long umbilical cord would supply me with oxygen and also pressurize my spacesuit. If there were a suit malfunction and the pressure dropped, a warning tone would sound in my helmet. Similarly, if the oxygen flowed too slowly through the umbilical and the supply was not refreshed fast enough, a warning tone would ring.

But would I hear it in space? It was such an even buzzing noise, easy to just disappear into the background. If I were losing pressure in the suit, there would be less oxygen to carry the noise and I might not even hear it. So I headed for a vacuum chamber in Houston, fully suited, to check it out.

With the technicians observing closely from the control room, we lowered the suit's oxygen flow rate until the buzzing tone sounded, and then kept lowering the flow. We all soon mentally tuned out the buzz. Like living in a house next to a freeway, after a while you don't notice the constant noise.

While I could still hear the buzzing, I stuck my finger in the spacesuit's outflow valve and dropped the pressure. The tone almost disappeared, because there wasn't enough oxygen left to carry it to my ears. After the tests, we changed the buzz to a loud, warbling tone like the siren on a French police car. It was impossible to ignore.

The original ideas for the film transfer and the buzz had looked good on paper, but did not work in practice. Throughout my training, I always tried to find the simplest, most practical way to carry out a task and then tested it thoroughly. It took extra time and effort, but I knew the experience might save my life, and the mission.

We trained hard right up to launch time, but also had to squeeze in some more personal duties. One was to name the spacecraft. Although NASA wasn't keen on personal touches like spacecraft names, they recognized that when two spacecraft docked and undocked they needed distinct call signs, otherwise the mission could get hopelessly confusing.

Farouk El-Baz came up with our command module name. We believed that our flight was the first truly scientific voyage to the moon, and this concept made Farouk excited to help us find some names. At Washington National Airport one day, he spotted a children's picture book about great explorers in history. Farouk bought it and gave it to me, and I shared it with Dave and Jim. As we turned the pages, we came to Captain James Cook and his pioneering scientific exploration of the Pacific two hundred years earlier. His first voyage took place in the sailing vessel *Endeavour*—Farouk particularly liked that name.

Dave, Jim, and I had often discussed spacecraft names, but every time we came up with an idea we found there was already a rocket or an air force program with the same name. So Farouk's suggestion was most welcome. We agreed with him that *Endeavour* seemed a natural fit.

Although it has caused a few misspellings in history books over the years, we stuck with the

English spelling Cook had used, with an extra *u*. If we used the name, we believed we needed to spell it right. Years later, I was delighted to see NASA name a space shuttle *Endeavour*, again with the original spelling.

The call sign for the lunar module was a much easier choice. The Air Force Academy's mascot is a falcon, the perfect name for the spacecraft that would glide and swoop down to the lunar surface. It also made a nice fit with the call sign for the Apollo 11 lunar module, *Eagle*. Coincidentally, the name El-Baz means "the falcon" in Arabic, so Farouk had a link to both spacecraft names.

Choosing the call signs was one of the few personal touches NASA allowed us. Another was to design a crew patch. We looked at hundreds of proposals and chose one submitted by, of all people, an Italian women's fashion designer.

Adored by the jet set, Emilio Pucci was famous for creating dresses in vivid, swirling colors, and his initial patch design was much the same. It was rectangular, with fancy curlicues in the corners, and in a shockingly vivid range of purples, violets, greens, and blues. It would have been hard to win NASA approval for this artwork.

Nevertheless, there was something in Pucci's design that really spoke to us. Most of the designs we had previously looked at were too complicated, too mechanical, or had little to do with the mission. The central feature of Pucci's design—three stylized flying birds—was wonderfully simple, elegant, and charming.

So we made some changes. The patch became round; the colors American red, white, and blue; and the background showed the lunar surface. We chose to depict our landing site area, so the three birds now swooped over the region we would explore. In Pucci's design, one bird flew higher than the others, and we made that bird white. That made sense to represent me, as I would fly alone in orbit while the other two swooped in for landing. It also matched the color of my Corvette. The red and blue birds were Jim and Dave, and if we kept with the Corvette comparison that would make Dave the blue bird and Jim the red bird.

We continued to tinker with the design until I believe we ended up with the best patch design of any Apollo mission. It described everything we planned to do, yet it was simple and recognizable. NASA wanted us to use the number 15 on the patch rather than roman numerals—and we did—but we also added something a little sneaky. By emphasizing some of the outlines of the lunar craters, we hid the roman numeral for 15 in the background. We were having fun.

Then, twenty-seven days before our launch date, we received a shocking reminder that we worked in a dangerous business.

On June 30, 1971, three Soviet cosmonauts were returning to Earth in their Soyuz 11 spacecraft after twenty-three days aboard the Salyut space station. It was an impressive achievement: the first successful visit to the world's first space station, which also broke the space endurance record. The cosmonauts were no doubt looking forward to a hero's welcome in the Soviet Union. Their spacecraft landed successfully under its automatically deployed parachutes. But when the recovery team opened the hatch, the three spacefarers lay in their couches—dead.

The cosmonauts were given a lavish state funeral in Moscow, with Tom Stafford invited to serve as a pallbearer. But the Soviets were cagey with details of how the three men had died. They told us they were investigating, and if they discovered anything important that might relate to the Apollo program, we would be informed. All we knew was that the crew had not worn spacesuits.

We prudently reexamined our schedule for wearing spacesuits during the flight, particularly for maneuvers that might expose us to vacuum, such as undocking. We had complete confidence in our spacecraft hatches and the tunnel between the command module and lunar module. But you never

knew what might happen up there. This way, we would be doubly safe.

The Soviets eventually revealed that when the two modules of their Soyuz spacecraft separated before reentry, a pressure valve seal had unexpectedly jolted loose. In less than half a minute, there was not enough air left to survive. That was too short a time to take any action unless they wore protective spacesuits. It was a tragic way to end a successful mission. Just over a month later, Dave Scott would gently place a memorial to the three lost cosmonauts, and all known fallen spacefarers, on the surface of the moon. It was a moving reminder that although we were on opposing sides in the Cold War, we shared a brotherhood of exploration.

The Soyuz 11 tragedy also made me think about my colleagues flying in Vietnam. If anything, it made me feel less guilty. I had always figured I had the easier, safer job, even after the Apollo 1 fire happened. Now, with the Soyuz 11 tragedy, the risks of flying in space felt about the same as the dangers faced by my friends in combat.

If I had never been selected by NASA and had been shot down and killed in Vietnam, I might have gained a brief mention in my hometown newspaper. However, if something bad happened during the Apollo 15 mission, I knew I would be remembered in the history books forever, which almost balanced the fact that I might die out there.

Many of us at NASA thought the Vietnam conflict was pretty stupid. Nevertheless, while I served in the military, I would never have openly criticized or second-guessed my country's foreign policy. The military enforces policy—they don't decide. I would have followed the orders of my commanders even if I'd personally felt wary of their decisions. It was the way I had been trained ever since I enrolled at West Point.

So I may have felt less guilty, but I still felt awkward. War was what people went into the military for, and what we were trained to do. My two West Point roommates were now flying combat missions in Vietnam. Worse, one of the stars of my West Point class was shot down and imprisoned for half a decade over there, and was so mistreated that he never really recovered. He came back a broken man. They were over there, unknown, unsung, fighting a war that I believed could not be won. And what was I doing? I was sitting pretty in Houston, walking red carpets, designing pretty patches with a fashion designer. I always felt a bit funny about that.

I didn't have time to think about the political scene during our intense training. But in addition to the difficulties, for the government, of an ongoing war, it was also a tough time for NASA. The Vietnam War was expensive. Washington wouldn't give NASA the money they needed to develop the space shuttle. Repeat missions to the Skylab space station, which was growing closer to completion and launch, were scaled back. A more permanent space station would evidently not be funded until long after the shuttle flew. Had it not been for a planned joint mission with the Soviets, NASA would have faced a lengthy hiatus while shuttle development inched along.

I was insulated from most of this political wrangling, because my mission was already bought and paid for. Although NASA pilfered all the money it could from other programs to fund the shuttle, they could siphon nothing from Apollo 15. I suppose they could have canceled the mission, but thankfully they didn't.

As we grew closer to the end of the Apollo program and fewer Saturn Vs thundered off the pads, jobs began to disappear down at the Cape. I heard stories not long after our flight about engineers who lost their jobs and simply walked away from their homes, defaulting on their loans. You could have bought hundreds of homes in Titusville back then by just picking up the bank payments. The boomtown that came with the early space program was going bust.

It was the start of a really tough time for the workers at the Cape, and there were rumblings of



morale problems. But I never saw that myself. Despite the cuts which loomed over them, the people I worked with were so excited to be part of our moon mission that they poured their hearts and souls into the preparations. I loved those people: they did so much to make our mission a success.

One more peripheral afterthought surfaced in the middle of the training grind. Something else I could stuff into my PPK. I spent little time pondering it. Bad mistake.

A few months before the flight, I was enjoying lunch at the Hilton hotel near the Cape with my car-racing friend Jim Rathmann, when he introduced me to a Miami friend of his. Jim was fond of this old man and thought I would enjoy meeting him, too. A jolly, chubby guy with long white hair and a silvery beard, the oddly named F. Herrick Herrick was striking to look at: a cross between Santa Claus and everyone's favorite grandfather. During the casual conversation, the subject of Spanish treasure from galleons sunk around the Florida coast came up. It turned out that Herrick had Spanish gold coins. It might be interesting, I thought, to fly some of that antique gold in space as a way to connect past exploration with our lunar trip.

During the lunch, Herrick tossed me his keys and asked me to go out to his enormous fire-red Cadillac convertible and bring him his briefcase. I did as he asked and brought the case back to the table. Herrick opened it and, sure enough, he had a hoard of gold coins and jewelry he said he had salvaged from a sunken Spanish treasure ship.

To say I was impressed is an understatement; I fell in love with the guy. Herrick struck me as a jovial, flamboyant, romantic soldier-of-fortune type, who told me tales of big-game hunting, directing movies in Africa, and other exciting adventures. He was so much fun and had done so much with his life that I never stopped to think how odd it was that he drove around with gold and jewels in a car trunk.

I didn't buy any gold from him in the end. Instead, our flight carried some Spanish silver, which I obtained from another source. Herrick proposed a different idea, eagerly suggesting something else to take on the flight. "Commemorative postal covers," he proposed and then had to explain what they were. I had never heard of them.

Herrick, evidently, was an avid collector and dealer of rare stamps. He offered to supply me with a bunch of lightweight envelopes, bearing a mission-related image, which could be stamped and postmarked the day of launch and also on the day of return. Inside, he'd place a card describing the spaceflight. He'd make them at his own expense and send them to me. In return, he asked only to have some after the flight for his own use. They would be mementos of my flight for the rest of my life, and I could also give them to family and friends, he continued. It sounded like a no-lose situation for me. Sure, I replied casually, get them to me before the flight and I'll take them.

I was very clear, however, in our conversation that day. We had a verbal agreement: he could give his covers away, but until the Apollo program was over, or I retired from NASA and the air force—whichever event was later—we agreed that neither of us would sell them. I didn't want to do anything that would embarrass either myself or NASA, and I believed Herrick was as good as his word. It was a huge lapse in judgment on my part to trust this stranger: I was too old to believe in Santa Claus.

At first, Herrick lived up to his promises. I discussed a cover design with a commercial artist colleague of his, and about two months before the flight Herrick sent me 144 covers. Most had a design on them showing the phases of the moon. We'd agreed that I would keep around 100 of them, and he would get the other 44 back after the flight. I added them to the items I planned to put in my PPK. I also added a Wright Brothers commemorative cover, autographed by Orville Wright himself, sent to me by Forrest Cook, a friend of my parents. Forrest, who lived in a small town just outside of Jackson, was a kind, gentle man and asked me to take the cover to the moon for him. I was happy to

help a family friend and right after the mission sent it back to him. I added all of these covers, and everything else I took, to the PPK contents list that I provided to Deke.

Jim Irwin added some postal covers to his PPK, too, and made sure Deke knew about them. He carried a few covers with a shamrock logo on them, many of which he gave to NASA friends after the flight. He even took more than eighty covers as a personal favor for Barbara Gordon, Dick Gordon's wife. She was an avid collector, and although her covers took up a good amount of Jim's PPK weight allowance, that was the kind of generous guy he was. Those envelopes flew on the mission and were given right back to Barbara.

I was done with my PPK list and thought I was done with thinking about covers for the flight. Then came another meal, another introduction to a new face, and another offer.

Dave, Jim, and I were in the middle of a tough training day at the Cape when Dave said all three of us were invited to dinner that night at the home of Horst Walter Eiermann, a German who I was told worked for a company that manufactured part of the Apollo launch vehicle. As Dave later explained to a congressional committee, he considered Eiermann a "rather close friend," with whom he'd had dinner a number of times. Dave said he believed it would be a really good idea for us to go, so Jim and I said yes, without asking more.

We were having cocktails before dinner when Dave and Eiermann started talking about postal covers. As Jim and I sat there and listened to the conversation, Eiermann suggested to Dave that Apollo 15 should carry a hundred special covers for a stamp dealer he knew in Germany named Hermann Sieger. He had previously arranged signed stamp deals with at least twenty of my fellow astronauts.

Jim and I, the rookies in the room, were assured that all of the Apollo crews had done this before. It's not a big deal, we were told. We'll be covered. We were reminded, rather ghoulishly, that insurance companies were no longer offering free life insurance to Apollo crews, and we needed to think of our families by making deals such as this.

Here was the plan: Apollo 15 would fly the covers, the crew would sign them, Eiermann would give them to Sieger, and then Sieger would hold them until the Apollo program was finished, or until we had all left the program. At that point, Sieger would be free to sell them, but only through private sales—no public, commercial visibility.

In return, Sieger said he would set up bank accounts for us, place seven thousand dollars in each, and if we left the money there and let it grow, the funds should pay for our children's college educations. Even back then it was not a lot of money, but when added to our small air force salaries, it would make a big difference. With the covers stored away after the flight, no one would know the plan until we were retired from NASA or the air force.

Dave and Walter both talked quite a lot about the plan that night. It was, essentially, a sales pitch. Everything was laid out for Jim and me, and already felt close to a done deal. Jim, who went along with everything Dave asked, said yes. Then it was my turn, and all heads turned to me.

I nodded my head and said, "Sure."

It was, without a doubt, the worst mistake I ever made.

That was the last I heard or thought about the covers until after the flight. I never saw them, never heard about them—nothing. I never saw or signed any written agreement, and never met Eiermann again. I assumed Dave would place the covers on his PPK list to submit to Deke. I knew all the covers from Herrick were on mine. I listed all the stuff I personally took, held nothing back, and had nothing to hide.

Had I thought it through at the time, I would have realized that the agreement with Eiermann wasn't

right. No one was really supposed to arrange to make money from the program while they were still in it. Even if the money would only appear after we had left NASA, the whole proposal was still shady.

I didn't break any formal rules, but in hindsight I broke an unspoken trust. As NASA Administrator Robert Frosch later admitted to a Senate committee, the agency's casual stance was that it was "generally understood—but not explicitly stated—that PPK items were personal memorabilia and not intended for future commercialization." Nevertheless, in hindsight, I believe that agreeing to Eiermann's deal was wrong.

So there you have it. To say I trusted my commander instead of my conscience is not much of a defense, I admit. Nor to tell you that I truly believed what I was told: that every other crew did it with no risk. Nevertheless, that is the truth. That is what I believed. And unless you have been in the military, particularly in situations of danger and split-second decisions, it is hard for me to explain how ingrained it is to trust your commander. If you trust him with your life, you trust him about a few lousy envelopes.

Therefore, after one evening of conversation, I forgot all about the covers. What arrangements Dave, Eiermann, and Sieger made to get the covers onto the flight, I never knew until later. Dave later told a congressional committee that he had placed them in a pocket of his spacesuit, but he never shared that information with me. All they had needed from me was a yes.

Completely unaware, foolishly naïve, even, about the ticking time bomb I had now thrown into my future, I continued furiously with my training.

We were almost ready to fly. But as we neared the launch day, I feared we were missing something. NASA was leery of letting little children witness live launches and imposed age restrictions. This limitation may have protected them, but it also missed an opportunity to engage them. I knew a Saturn V launch was a pretty astounding experience, and children grasped the excitement of flying to the moon in ways that adults did not. If we wanted public support for NASA and space travel, we needed to inspire and inform the kids.

So a few weeks before the flight, I picked up the phone and called the *Sesame Street* production offices in New York. The children's show had been on TV less than two years, yet it was already highly regarded as an educational and stimulating experience for young minds.

Reaching a producer, I explained my idea for an episode about an Apollo launch. Maybe, I suggested, they could send a film crew down to the Cape to capture the event. Vicariously, then, the kids would feel the impact and excitement. The producer didn't sound too interested. "Most of us are beginning our summer break," he explained wearily. "It might be hard to pull a crew together. Call me back in a week," he sighed, "and I'll let you know."

I called him back in a week. They could come to the Cape, but the show wanted something in return, the producer declared rather pompously. Puzzled by his approach, I asked what it was. "Your spacecraft," he responded. "We'd like you to name it 'Big Bird,' after our show's lead character."

I imagined for a moment our gleaming spacecraft. Then NASA's reaction if I had asked to rename it after an eight-foot-tall, bright yellow canary. I looked at the receiver and said "Thank you very much and good-bye." Screw *Sesame Street*.

I'd wasted a precious week, and we still needed kids. So I immediately called Pittsburgh, and another children's show, *Mister Rogers' Neighborhood*. The producer put me right through to Fred Rogers, the show's much-loved host. We chatted for a few minutes, I explained my idea, and he replied that it fit perfectly with a series he was filming about parents going away. He wanted to teach children about fathers leaving the house to go down to the store, leaving in the morning to go to work,

or going on a trip. This was a perfect match, he told me—Dad is going to the moon for two weeks. As a father, I could relate. Fred proposed filming a show both before and after the trip. A great idea, I agreed.

Fred put me on hold for a few minutes and lined up the PBS Nova mobile filming crew in Boston, probably the best crew in the nation. They were available, and we scheduled it all in that first phone call.

Three days before I began my pre-launch quarantine period, the film crew arrived at the Cape. They filmed Fred and me talking about space in the launch control center, then I showed them how I put on a spacesuit and how each part worked. Fred worked through a long list of kids' questions about astronaut experiences. I could answer many of them, but I had to confess I couldn't answer others until after my flight. I asked Fred to let me take the list into space. I would think about them during the flight, I promised, and then answer them when I returned. Fred liked this idea. In fact, instead of making two regular shows out of the footage, he would now do a special.

I worked on a number of follow-up shows with Fred, and we really hit on what kids wanted to know. For example, children were fascinated by space food, so I took some to the show to reconstitute, and Fred and I ate it right there on air. I took a large moon rock to another taping so the kids could look at it. Those shows did a lot of good, bringing a human element into spaceflight. Many of the ideas evolved into a children's book I wrote in 1974, named *I Want to Know about a Flight to the Moon*. Fred wrote the foreword.

But I did get some good-natured ribbing at the Cape. A few days before the flight, in quarantine, we heard an announcement over the PA system: "Everybody get to a TV set." Sure enough, it was the Mister Rogers special. It was so far outside of what most astronauts did, many thought I was crazy. Astronauts liked to think they were superjocks who hunted, fished, drank, and chased girls. We didn't do kiddies' shows. They particularly made fun of me when I carefully navigated the inevitable "How do you go to the bathroom in space?" question. But I loved the final result, and Deke got a good laugh out of watching it. Most importantly, kids loved it.

Our quarantine at the Cape started a few weeks before the flight. Nobody wanted a slight sniffle to delay a multimillion-dollar lunar mission. Those who worked with us directly wore surgical masks. Everyone else we saw only on the other side of a glass window. Farouk and I continued to work on my geology training on different sides of the glass, and I chatted to a lot of visiting dignitaries, too.

My parents made a vacation out of the launch. They drove their tiny travel trailer all the way down from Michigan and stayed in a little trailer park in Cocoa Beach. We visited through the glass. My brothers and sisters arrived a little later, followed by my girls, Alison and Merrill. Their mother didn't come with them, but NASA took good care of my daughters; they flew them down in a Gulfstream jet from Houston. Like most astronaut kids, none of it seemed like a big deal to them. Many neighborhood dads went to the moon, so this was no different from the stories their friends told.

I was very upbeat about the flight. I never said anything to my family about what might happen to me other than the positives of the mission. I never wrote letters to my daughters in case I didn't survive or anything like that. Nevertheless, the thought was in my mind that I might never return. I never shared those feelings with anybody at the time. I didn't see the point. But I did make sure my will was up to date. That was pretty simple: all my possessions would go to my daughters.

I talked to my closest friends a lot on the phone. But one night, I decided the quarantine was crazy—I would make a break for it. After the lights were out and we were supposed to be asleep, I silently snuck out to my car and drove into Cocoa Beach to meet up with my buddies at a pre-launch party. One was a very special lady whom I was close to at the time, and it meant a lot to me to say good-bye

to her in person. I couldn't stay out for long, and it was certainly against all the rules, but I took the chance. A close friend on the medical team was also there with me, and she could have lost her job if anyone spotted us. If my bosses had checked the space center gate logs, we would have caught holy hell.

The night before the flight, Jim Rathmann also threw a party for my family and friends. I couldn't attend, of course, because we were watched far too closely at that point to sneak out, but I did get to chat with close friends over the phone. I remember thinking that this could be the last time I talked to them. However, the concern was less for myself. I strongly felt that if something bad happened and we died on the flight, it wouldn't bother me. Danger came with the job. It would have *really* bothered me if I were the person who caused it. I think we all felt that way. None of us ever wanted to be the one who caused a major accident or incident. I never wanted to be the one my colleagues pointed fingers at and said, "Hey, you screwed up."

Even though we were in quarantine, we could still keep ourselves sharp with some flying. We'd head over to Patrick Air Force Base, just south of our launch site, making sure not to interact with anyone on the way. Then we flew around in T-38s, which allowed us to have fun and shake off tension. There is a lot of pressure right before a flight, and flying allowed me to relieve it. Additionally, there was talk about people feeling disoriented, dizzy, and sick in weightlessness. I tried to put my inner ear through as many weird sensations as possible in a jet, hoping to prevent any motion sickness. I would roll, spin, and have fun. I don't know if it helped, but it was a great way to blow off steam.

The last thing I wanted to do was crash, so I was particularly careful not to do anything crazy. Naturally we couldn't fly too close to our launchpad, but I took the time to look over in that direction, miles away. What I could see was spectacular.

From a distance, I could easily spot two things. One was the Vehicle Assembly Building, where the Saturn V rocket was assembled. The largest one-story building in the world, it dwarfed everything in the area, except for one other, more temporary landmark. The gleaming white Saturn V rocket looked like a toy from ten miles away, but it was still very visible. As I flew closer and compared it to the surrounding landscape, the scale really hit me. Our rocket was enormous.

More than 360 feet tall, the length of one and a half football fields, the Saturn V was on top of a launchpad that pushed the tip of the rocket to about 500 feet above the coastal scrub. It was incredible to think I would soon be sitting on top of this leviathan. I took time to study it and drink in the experience.

The first stage of the Saturn V was enormous and squat, more than 130 feet tall, with five engine exhaust nozzles, each so big a person could crawl inside one of them. Capable of creating millions of pounds of thrust, the first stage could shove the entire rocket stack most of the way into space.

Despite its enormous size, that first stage wasn't enough. Above it sat a second stage, more than 80 feet tall, to thrust us through the upper atmosphere. When the first stage ran dry, it would fall away as the second stage ignited its own five engines and slammed us upward.

The second stage could get us most of the way into orbit and was the last part of the rocket to fall back down through the atmosphere. Everything else would go to the moon. Above that second stage was a slimmer third stage, almost 60 feet tall, with one big engine that would get us into Earth orbit. Once there, that engine would relight to accelerate us out to the moon.

Above these three giant stages, I could see where the rocket again tapered in, this time quite dramatically. I knew that inside this flared fairing sat the *Falcon* lunar module, its legs folded up, bolted in, and protected for the ride into space. Then, at the very top, looking tiny compared with the

rest of the rocket, was our command and service module. Perched beneath a launch escape tower, designed to pull us safely away if anything went wrong with the rocket beneath us, was the *Endeavour*.

It was amazing to think that it would only take a few minutes for most of this huge, precision-constructed Saturn V rocket to do its job. Then it would be thrown away. Within the first day of the mission, two of the three stages would be in shredded pieces at the bottom of the ocean, while the other would be condemned to a collision course with the moon. Our *Endeavour* was the only piece of the spacecraft that would return, and even then it would never be used again.

Reluctantly, I turned my T-38 away from the Saturn V gleaming in the distance and back to the airbase. The scale of the rocket had made me philosophical about my small part in an enormous program and an enormous concept. The idea of voyaging to another world was something much bigger than us as mere people. It was worth more than human lives. In that moment, I felt deeply that I was a small piece of something transcendent—something wonderful. I was ready to fly.

The night before launch, still in quarantine, we had a last supper with our backup crew and support crew, plus some select engineers and technicians. The chef prepared a wonderful meal, accompanied by a couple of bottles of champagne. We eventually sent him out to get a couple more bottles. It certainly took the edge off. After I made a few final phone calls to some of the pre-launch parties going on around town, I fell into a dreamless sleep, comfortable and happy, fooling myself into thinking that tomorrow would be just another day. I surprised myself by being so relaxed.

But who was I kidding? Tomorrow would be a very different kind of day. Space beckoned.



## CHAPTER 8 LAUNCH

You never forget launch day. Finally, your mission is about to begin. You are in a special zone, like an athlete walking out for an Olympic event. Whatever happens, you know the day will be extreme and unforgettable.

It was Monday, July 26, 1971. Deke Slayton woke me up around 4:30 a.m. inside our windowless crew quarters at the Cape. I'd slept well and was ready to go. It was only a short walk to the medical room, where a flight surgeon gave me a brief physical. I'd had a physical every five days for the last three weeks and—once again—the doctors found nothing wrong with me.

I was not keen on the doctors and their tests. I remembered when Wally Schirra told me a story about the urine sample he'd given just before his Gemini flight. He asked the doctor why they needed another sample and was told it would be carefully analyzed and compared to a postflight sample to see if any changes took place in the flight. When Wally visited that same flight surgeon's office six months later, just for kicks he walked over to the refrigerator and opened it. His sample still sat in there, untouched.

But I was delighted to see Dee O'Hara, our astronaut nurse. Dee came to the program long before I arrived. She started at the same time as the Mercury astronauts and quickly became good friends with them. While our flight surgeons came and went, Dee was always there for us. Officially, she checked each astronaut just before every single manned launch. Unofficially, we also went to her with any minor ailments because we knew we could trust her. She was kind enough to look out for our wives and kids too.

Since my divorce, I had come to know Dee even better. We palled around together; there was quite a bond there. I cared for her like you care for a close sibling. I was very pleased to see her that morning for my final medical checks.

I was behind a stall providing a urine sample and figured it was time for a bit of good-natured fun. "Hey, Dee," I called out from behind the partition, "I'm stuck. Can you come and give me a little help?"

"Dream on, Al!" Dee replied with a laugh. "By the way, I know where I plan to watch the launch from today, but how about you?"

"Gee, I have no idea," I quipped back. "Maybe I'll head down in the direction of the beach."

Dee had a comeback for everything. "I know this is your first launch, rookie," she added, "so you might want to try and find a spot that is up high. You'll get a better view."

Dee was exactly what I needed that morning to make me laugh, but our time together was all too brief. I headed to the room next door, where a barber gave me a quick haircut. Who knows why—it was part of the pre-launch protocol, and I just went along with it. Perhaps we would see some strange

aliens up there and we had to look our best.

It was time to join Dave and Jim for breakfast around a big table, along with Deke and our backup and support crews. Everyone else was dressed by then, but I stayed in my bathrobe. I was about to put my spacesuit on, so why dress just to undress again? A meal of steak, scrambled eggs, and toast was a good way to start the morning, but it was also a carefully designed menu. Our low-fiber diet meant we could delay taking a crap in space as long as possible. I washed it down with a last cup of hot coffee.

Soon enough we had to walk over to the suit room, where we dressed in our spacesuits. First, however, we strapped on biomedical harnesses to keep track of our breathing and heart rate. Then a urine collection device, so we could take a leak in the hours ahead without removing the suit. Next, a pair of long johns, followed by the bulky spacesuit. Once the suit was all zipped and buttoned up, the suit technicians put on my helmet. I was now in my own enclosed world. It was odd for me to think that the next time I took my helmet off, I would be up in space.

After the technicians ran a pressure check on my suit, I settled in a reclining chair and started to breathe pure oxygen. I lay there alongside Dave and Jim while we purged the nitrogen from our blood just like deep-sea divers. The ceiling lights bothered Jim, so he asked for a towel to be placed over his helmet. With nothing else to do but lie there, all three of us soon dozed off.

It didn't seem long before we were awake again, as the calls came in from the launch control center. Everything looked good for an on-time launch. We each grabbed a portable ventilator, headed along the hallway to the elevator, and descended to where a transport van awaited us. The hallway was crowded with well-wishers from the flight crew quarters, all waving good-bye and wishing us good luck. With my helmet on, I couldn't hear them well—only the sound of my own breathing. And in my bulky spacesuit, that hallway felt pretty narrow. I was excited and flashed a quick V-for-Victory sign to the cameras.

As I came out of the doorway of the building and over to the van, I had a nice surprise. Some of my family were there, along with Deke Slayton. My father and I exchanged grins, and he held out his hand. I didn't even have time to break step, we were on such a tight schedule, but I grasped his outstretched hand as I passed him and gave it a quick squeeze. My sisters and brothers were there too. I don't know how they got out there—it wasn't where families normally stood—but I suspect Deke worked it out for them. He was very good to my family in the days around the launch.

The seven-mile drive to the launchpad dropped us off two and a half hours before liftoff. Through the van windows, we could see the crowds of people lining our route. It looked chaotic, and we were glad to have a police escort. We joked that if the liftoff was scrubbed, we had better find a different way back, because we didn't want to run that gauntlet in reverse. Especially if some of those people were upset that we hadn't launched.

I was pleased so many people were there. If public interest in Apollo was tailing off, you couldn't tell that day. Tens of thousands of people were gathered inside the space center perimeter, including more than five thousand specially invited guests. Outside the center, the press reported that around a million people had gathered to see the launch, and the nearest vacant hotel room was more than fifty miles away.

It looked like we wouldn't disappoint them. The weather was perfect for launch. As I stepped out of the van, I looked at the clear blue sky and grinned. Up close, the Saturn V looked amazing—it gleamed in the morning sunshine. I thought back a couple of nights, when we had all driven our Corvettes out to the launchpad. The white rocket had been lit up by bright spotlights; it looked spectacular against the black sky. In the morning it was still gorgeous, but I always thought the most



impressive sight was at night, lit by all those spotlights.



*My father (far left) reaches out his hand to touch mine as I head for the launchpad.*

The weather was humid, which was not unusual for a Florida summer. The Saturn V had been filled the night before with supercold liquid oxygen and liquid hydrogen, and some of that deep chill had spread through the rocket walls to the outside. The humidity in the air stuck to the skin of the rocket and froze, so when the three of us arrived we could see ice everywhere.

The rocket was huffing as puffs of vapor vented from it; the tanks were continually topped off. The Saturn V reminded me of a tethered animal pawing at the ground, ready to run. It no longer seemed like a large chunk of metal—it appeared to fume with frustration, ready to be unleashed, unrestrained.

We stepped into the elevator for the long ride to the top of the rocket, hundreds of feet up. It was the equivalent of taking a ride to the thirty-fifth floor of a skyscraper. The elevator rose and rose. Wow, I thought, it is a long way down to those engines.

When we reached the top, I gazed down the beautiful coastline, and observed the distant buzz of spectator activity. As I looked down the immense rocket, I saw chunks of ice rain down as they sloughed off its skin. It was a weird surreal effect, like a science-fiction movie.

We walked across a metal catwalk to the spacecraft; a difficult task for some, the pad engineers told me. Other astronauts had looked down at their feet, saw the distant ground through the metal mesh, and that was it. Their hands went out to the handrails, and the pad engineers had to come and convince them to keep moving. Some had to have their fingers pried from the handrails.

I wasn't too surprised at that reaction. We were a hell of a long way up. And it didn't matter how skilled we were flying aircraft, it felt very different in a jet. If you stand on a launchpad that high, your stomach naturally does flips when you look over the edge.

At the end of the catwalk, a little temporary structure kept birds and any other contamination out of the command module. Called the White Room, this was the domain of Guenter Wendt, the pad leader who saw off all the manned flights. We knew he'd take care of the final details, ensuring we entered the spacecraft smoothly and the hatch closed correctly.

Vance Brand, my backup for the mission, was inside the spacecraft when we arrived. Vance had been great to work with. A quiet fellow, he had just done his thing and not made any waves. He now checked all of the switch settings inside *Endeavour*, and prepared to help us slide inside. In the meantime, Guenter cracked some jokes with us over the radio headsets and generally eased the tension. But I was so focused on my job I don't recall what he said.

It was a tight fit inside the spacecraft in those bulky suits. Each of us had to slide through the hatch into our individual collapsible couches, which were made of hollow steel and covered in fireproof cloth. Dave and Jim entered first, while Vance remained inside to help them. Engineers connected their oxygen hoses to the spacecraft, and tightened their couch straps. Then Vance exited, and I slid into the center couch. The engineers could then connect me and strap me in just by reaching through the hatch.

Guenter ran the process like clockwork, and soon it was time for the technicians to close the hatch. The last face I remember seeing was Guenter's, smiling and waving an enormous crescent wrench at me. Then the heavy hatch closed with a deep *thunk*. That was it: we were truly on our own, cut off—committed.

About two hours remained until launch. Guenter and his engineers needed some of that time to break down the White Room, ride the elevator to the base of the pad, and drive away. It was as if they had placed a bomb on the launchpad and set the timer. Soon all but a few emergency teams were three and a half miles away, considered a safe distance. If something went wrong with the rocket, the explosion would be immense. Everyone was now safe. Everyone but us.

I had no sense that we were hundreds of feet up in the air on the tip of a rocket. It was dark, with only a tiny window letting in any light. In our spacesuits, squeezed in with our shoulders overlapping, we could have been in a simulator.

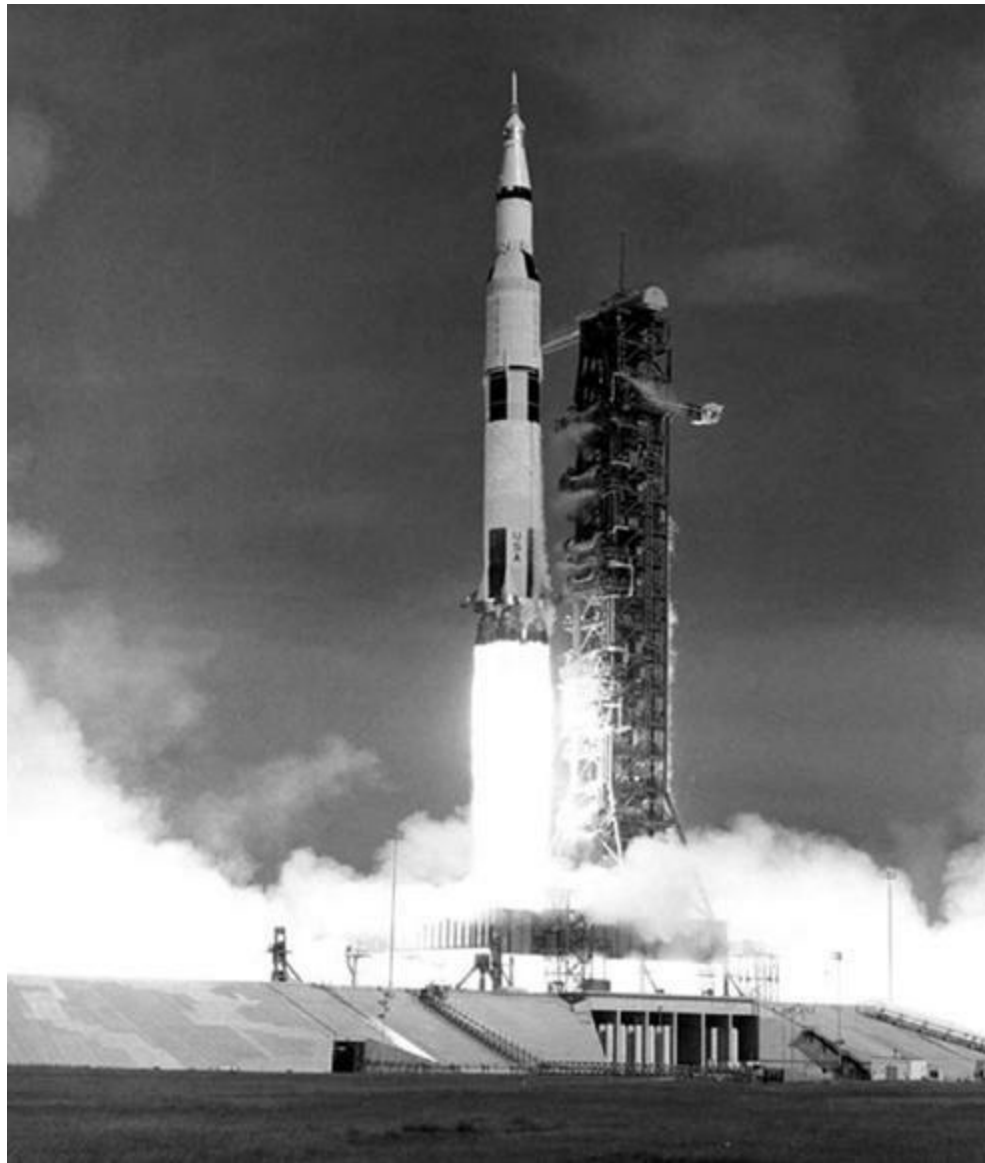
Dave was to my left, which was normally my seat, but he was responsible for the launch, so he sat there for now. We would trade places later. Jim, to my right, dozed off again. It grew really cold. Icy, chilled air blew into the cabin and into our spacesuits, because if something went wrong on the way into orbit there was an abort mode that could have heated the spacecraft a lot. To compensate, they cooled us down. There wasn't much to do but wait, in the dark and cold.

We had scheduled holds in the launch countdown, in case we needed time to analyze any little glitches. But we never needed to, so the minutes kept rolling toward launch time. Every once in a while someone would report over the radio from launch control, but it was all very matter of fact. I could only hear an alternator and a low hum in the background, and it was easy to drift off to sleep while I waited.

Twenty minutes before launch, it got busy again. The access arm to the hatch pulled away, and sunlight flooded into the spacecraft through an exposed window. Soon afterward we went to full internal power. We were carefully severing our bonds with earth. In the final minutes, the automatic countdown system took over. If something didn't look right, the countdown would pause, but otherwise the system would launch us at the precisely planned time.

Eight seconds before launch I heard a turbine crank up, which drove a fuel pump. I could only hear noises transmitted through the rocket's metal structure, since the action all took place more than three hundred feet below me. I heard the valves in the fuel lines flip open and the propellant rush through.

Then the engines ignited in a fury of flame. It was 9:34 a.m. We launched within a tiny fraction of a second of our planned time.



*The launch of our immense Saturn V rocket*

There was a part of me that had not mentally committed to launch until that moment. We could always have climbed out of the spacecraft. But now, it was all or nothing. It wasn't a simulation. It was *real*. "Okay—liftoff!" I confirmed to launch control.

I was later told our Saturn V rocket could be heard a hundred miles away, shaking the onlookers with a popping and crackling vibration. Inside, I heard hardly any noise: only a muffled roar far beneath me, as the engine thrust vibrated up through the rocket structure. We began a smooth, slow rise from the launchpad in an eerie kind of silence.

Although the rocket pounded the pad with a punishing amount of thrust, we moved upward very slowly. The rocket was so heavy that it took us around twelve seconds to clear the launch tower. I could feel the engines swivel as they leaned the Saturn V away from the tower. We were so delicately balanced in those first seconds that a strong gust of wind could have blown us into the tower if the rocket had not tilted away.

I expected to feel more vibration and was surprised by how smoothly we rose. Almost as soon as

we were above the tower, the rocket picked up speed and rolled automatically to place us on the right path for orbit. I stayed busy watching the trajectory on our instruments, checking my cue card, which told me that we had to be at certain altitudes at precise times, moving at a specific speed. Everything was going according to plan. I also kept an eye on Dave, who had a grip on the abort handle. If anything went wrong, a firm twist of his glove would activate the escape tower and shoot us clear of the Saturn V. The mission would be over.

During our training, Jim and I had jokingly pleaded with Dave, "Please let us hold hands with you when we lift off." Not because we were scared, but because we wouldn't let him end our mission. In fact, just before liftoff, Jim and I had each placed one of our gloved hands on Dave's glove. To an outsider, it would have looked like a Three Musketeers "all for one, one for all" moment: a touching bond between three explorers. In truth, it actually was us reminding Dave, "Don't you dare twist that damn handle." I was glad we had an escape option, but I would rather have died than see Dave abort the mission unnecessarily. Fortunately, everything continued smoothly on our ride into orbit.

We quickly went supersonic; the engine noise could no longer reach us. We passed through the period of maximum dynamic pressure on the rocket in the second minute, and I felt us shake and roll a little, but we held steady. Stay cool, I told myself. I'm not nervous, I can do this. Even if the ground finds out I am nervous, it will be too late. We'll be in space.

Our trajectory was arcing, but it still felt as if we were heading straight up because the acceleration pressed me back into my couch. As our propellant burned the rocket grew lighter and faster, and the G forces built up until we felt four times heavier than normal. We were high above the thickest part of the atmosphere, and the rocket pushed forward, faster and faster.

The feeling was not uncomfortable. I didn't notice it in most of my body, because I was wearing a heavy spacesuit. I really felt it in my hands. I needed to use the instrument panel in front of me and I grew a little concerned trying to reach those switches. Not only did I have to move the weight of my arm against that acceleration, I also had to move the weight of the suit. Luckily, it never grew so bad that my arm was pinned down.

Less than three minutes into the flight, we were already fifty miles from the launchpad. The first stage had done its job, and it was time to separate and let it drop into the ocean. We'd talked about this moment a little in training, but not much. I knew the first stage would shut down, we would separate, the second stage would light, and away we'd go. Sounded simple enough. I was in for a surprise.

We were pressed down in our couches, feeling heavy, when the first stage engines shut down. It felt like we'd slammed on the brakes of a speeding sports car. Jim and I instinctively threw up our arms, fighting the feeling that we would break through our restraining harnesses and smash right through the instrument panel. Dave, on the other hand, hardly moved. After we finished flailing around, I looked over at him, took a deep breath and asked, "Dave, what is happening?" Dave gave us the confident smile of someone who had flown a Saturn V before. "Oh, that's normal. No big deal. I just forgot to tell you about it."

"Man, you aren't kidding," I replied, with a raised eyebrow. It had scared the hell out of me.

It turned out that not everything was going to plan. Back on the ground, flight controllers had just lost the instrumentation from the first stage. The thrust from the first stage engines had decayed more slowly than expected. The stage had small retrorockets to pull it away before the second stage lit. They had halved the number of retrorockets on our Saturn V to save weight, but it was a cut too far. The stages stayed dangerously close to each other, and when the second stage engines fired the exhaust fried the electronics on the first stage. We were lucky not to collide with it.

We would only learn of this near mishap later. As the second stage engines lit, we were once again pushed back into our couches. We were a shorter, leaner, lighter rocket now. We blew off our launch escape tower, as we were too high for it to do us any good. Now we could see out of all the windows, as the sky grew ever blacker. “How are we doing, Al?” Dave called across to me.

“We’re doing fine,” I responded, focused on my instruments.

“Man, I’ve got the moon in my window!” Jim exulted.

“Yes, sir, it’s out there,” I replied. Plenty of time to look at it later. “That sucker’s right on, right on,” I reported, impressed by the precise path of our rocket.

The second stage was a comfortable, soft ride, but not powerful enough to kick us into orbit. Having done its job, it also dropped away—a smooth, easy transition. We hurtled up at more than fifteen thousand miles an hour, while the second stage began a long, tumbling fall to the ocean. As the big engine on the third stage lit, we needed to raise our speed by only a few thousand miles per hour to reach orbit.

I watched the instruments as the third stage gradually arced us into a path that would keep us circling the Earth. During the last part of the burn, we even angled down toward Earth a small amount, so we could loop into orbit. We fell around the planet in a beautifully precise curve, not falling back to Earth, nor leaving it behind. Not yet.

At last, the third stage engine shut down. Less than twelve minutes had passed since we’d sat on the pad. Now we were traveling more than seventeen thousand miles per hour, and I was in space. After all the years of training, I was finally here.

Jim and I unstrapped ourselves and floated to the windows. Jim tried to dig the TV camera out right away, to capture the view. Dave had seen it before, of course, but Jim and I had never witnessed such a sight. The beautiful planet Earth stretched below us, with a thin horizon that knifed between sky and black space. It was stunning and strikingly delicate. And because we were so low, we zipped across oceans and continents in minutes. “I guess I hadn’t really thought it would be visibly this fast,” I murmured to Dave and Jim.

I could have spent the next hour just staring. All too soon, however, mission control in Houston radioed and reminded us to get to work. We busied ourselves with checklists. We didn’t have much time until we had to leave Earth orbit. Before we could do that, we needed to thoroughly check out our spacecraft and ensure it had reached space in good shape. If it hadn’t, we might have to return to Earth immediately. I tore my gaze from the window and got busy.

I’d spent years training inside command modules, but it had always been in Earth’s gravity field. Now I was weightless, and the command module felt very different. I had no walls or floors any more, no up and down, just surfaces and space to float around in. On the launchpad, the spacecraft looked cramped. Now it felt roomier. As we checked out the spacecraft, I floated under the seats and up into the docking tunnel. *Endeavour* still wasn’t big, but it felt different when all the interior space could be used.

Weightlessness felt *odd*—like swimming underwater, but without water pressure on me. I was concerned I might feel “space sick,” an affliction similar to motion sickness that affects some astronauts when they float around, so I used a trick to keep it at bay. On Earth, I had found that if I focused on a task, I didn’t have to worry about motion sickness. So I floated around as much as I could, figuring this was the quickest way to get over any nausea. Dave warned me to slow down a little, worried I might grow ill. But I would be weightless for two weeks and I didn’t want to just sit back and feel bad. “Get your big foot out of the way!” I joked as Dave floated into my face. “Push me down,” he instructed, and with a gentle nudge I floated him away. This was strange, but *fun*.

Jim tended to float to the top of the spacecraft, like a swimmer in a pool. Dave generally kept himself strapped in his couch, explaining that “Otherwise, you’re fighting the panel all the time.” He was right: the slightest movement in the couch floated us into the instrument panel.

There was nothing I could do about the stuffy feeling in my head—as if I were hanging upside down. I could see Dave and Jim felt the same. Their faces were flushed and puffy, and their eyes bulged a little.

There wasn’t time to let the discomfort affect me. We were all very busy. We were in a low Earth orbit—too low to linger long—and could only go around the Earth for a couple of hours before we needed to head to the moon. This was the only time in the mission I would see Earth up close, but so far I’d barely had a glimpse of it out of the window. The clock was ticking.

Fortunately, our spacecraft had made it into space in good working order. I now had time to briefly reflect on the mission so far. “That was a fantastic ride!” I shared with my crewmates. “I’m just now beginning to understand what went on. That first stage really does shake!” Jim’s wide grin told me he knew just what I meant.

After two revolutions of the Earth, it was almost time to relight the third stage of our booster, and head to the moon. Before we did, we all took a lingering look out of the window. I gazed at lightning skipping across the tops of distant clouds. “This is unreal to watch,” I said with amazement.

“It’s so pretty out here, Dave, I’d almost settle for an Earth-orbit mission,” Jim said wistfully.

“*Don’t* you say that!” Dave responded with mock authority, convulsing me with laughter. It was true: Earth was beautiful, but we ached to press onward to the moon.

The third stage engine relit. For more than five minutes, a soft but solid acceleration pushed us back in our couches again. Our speed climbed to twenty-five thousand miles per hour. Now, instead of falling around the Earth, we were fast enough to climb to a point, days away, where the moon’s gravity would capture us.

We were shooting for a moving target. Because the moon orbits Earth, we had to aim not for the moon itself, but where the moon was *going* to be. It was like firing two bullets, wanting them not to hit each other, but to barely miss. If we got it wrong, space was an unforgiving place. We had to trust the math in our flight plan completely. We checked our numbers *a lot*.

Once the burn was successfully completed, we had time to briefly look out of the window again. Earth had already begun to shrink. Our planet is only eight thousand miles in diameter, and we traveled three times that distance every hour. I could see our launch site in Florida, and the rest of the southeastern United States and Cuba, all in one view. How different it all looked from here.

Time to get back to work. One of my key jobs in the mission was right ahead. Our lunar module, *Falcon*, was bolted into the third stage, still below us. Three and a half hours into the mission, it was time to extract it. I floated over to the left couch, from where I could fly *Endeavour* while I peered out of the left window.

We blew the bolts that connected us to the stage, and with a delicate pulse of our thrusters I edged *Endeavour* away. Large hinged panels opened like petals on a flower and drifted away from the top of the stage, exposing the top hatch of the *Falcon*. We crept away a short distance, then I very slowly rotated us 180 degrees. What was the hurry? We had days before we would get to the moon, and my slow and careful piloting saved precious fuel. Out the window, I spotted a panel spinning away into the blackness. The shrinking Earth also fought for my attention. “What a view!” I remarked, then focused again on my target.

Within ten minutes, we slid back to the third stage. *Falcon* looked delicate, as if it was made of smoothed tissue paper. Better dock with it carefully, I thought. Its round hatch looked back at me like

a dark pupil in the enormous round eye of the third stage. Wow, our rocket was *huge*. I pulsed the thrusters again a tiny fraction and nosed up toward our lunar module, head to head. I ignored the hatch and focused instead on a small white target off to one side. Using an optical sight, I placed my crosshairs firmly on the center of the target. As my crosshairs drifted off, I gave the thrusters a little squirt to edge back toward dead center.

I nailed it. “We’re sliding in there,” I told Dave. “I feel it.” The docking probe on the top of *Endeavour* touched the edge of the concave cone on top of *Falcon*, then slowly slid down the cone into a hole barely large enough to encompass three spring-loaded latches. Were we in enough to latch together? I pulsed the thrusters, and pushed into the hole a little faster. The latches sprang into place and held the spacecraft loosely together—a soft dock.

“We’re off at a little bit of an angle,” I noted to Dave and Jim. We were slightly misaligned with *Falcon*. But it was no big deal. I retracted the docking probe, which pulled the spacecraft together and swung us into exact alignment. With a loud bang and a shudder, twelve more capture latches pulled us into a hard docking. “Great! Boy!” I laughed.

Soon after we docked, Dave noticed a problem. “The SPS Thrust light on the EMS is now on,” he radioed to mission control. The instrument panel light told us that *Endeavour*’s engine valves were open, and our enormous main engine should therefore be firing. But it wasn’t, and we did not want it to. We immediately pulled the circuit breakers so that a short circuit couldn’t inadvertently light the engine and thrust us hard against our fragile *Falcon*. While the ground puzzled over the problem, we connected umbilicals between *Falcon* and *Endeavour* through the docking tunnel, checked the docking latches, and prepared to pull *Falcon* out of the spent third stage. I tried not to think about serious engine problems, but I knew that engine was our only way to return from lunar orbit. If it didn’t work, our mission might be scrubbed after only four hours in space.

We pressed ahead. Closing the docking tunnel hatch again, I armed the explosives that would cut *Falcon* loose from the third stage. Springs would push the lunar module out while we backed away with it, firmly attached. I felt the thump as we separated and slowly drifted away from the last piece of Saturn V. It had given us a good ride. Now it would follow us on a slightly different path and crash into the lunar surface in three days’ time, an hour after we were due to enter lunar orbit. I couldn’t see it anymore, as *Falcon* filled my window. Now it was time to work through some troubleshooting procedures with the ground for our faulty engine light.

About an hour after we first spotted the light, the ground sent us potential solutions. They suspected a short circuit, and we hoped to isolate its location. I floated over to the left-hand couch and carefully checked circuit breakers and switches, moved the hand controller, and watched for the light to go out. The light didn’t change.

Shortly afterward, Karl Henize radioed to say that the tests had only proven the problem was not a simple one to isolate. Mission control would ponder the evidence and get back to me. Damn. Nothing to do but continue our busy day, and hope.

I’d made a quick navigation check while still in Earth orbit, and now I needed to confirm our position between Earth and the moon. I floated behind the couches and peered through the optics to check our journey against the backdrop of Earth, moon, and stars. Working the computer, I checked the angles between the ever-shrinking Earth and a couple of stars, fine-tuning our position in space.

Once I’d finished navigating, I placed the spacecraft into passive thermal control mode—or “barbecue mode,” as we called it. With no atmosphere in space, the heat from the sun was brutal, and it could scorch the spacecraft skin while the shadowed side chilled far below freezing. Spacecraft systems could fail and windows could crack if we allowed this extreme temperature difference. A

slow, gentle spin maintained an even temperature. We'd spend most of our time rotating this way.

Mission control called with more tests for that pesky light, so we teased switches back and forth to see if the light flickered. Dave gently tweaked a switch to halfway on, and the light flickered off. "Gee! Good grief! Wonder why it'll do that?" I queried.

"It's a switch problem," Dave theorized, to me and the ground. "I bet we've got a little solder ball in that switch or something." He was right, although we couldn't confirm this until we returned to Earth. A tiny piece of wire, less than a tenth of an inch long, was stuck inside the switch, creating a short circuit. Such a tiny object, but it could have canceled a moon landing. Even after all the meticulous work we'd done in Downey, it had been impossible to catch everything. But now that we knew the problem and that fortunately it was isolated to a small area, we could come up with a procedure to work around it.

We'd planned a small engine burn that first day, to refine our course to the moon. Luckily, my navigation sightings showed we were sufficiently on course. The burn could wait until the next day, while mission control refined their solution for the faulty engine switch.

Eleven hours into the flight, and we were already a quarter of the way to the moon. But Earth pulled on us; we constantly fought its gravity as we sped away. After a fast start, it would take us two and a half days to reach a point where the moon pulled on us more. Until then, we'd steadily slow down.

It was time to eat. We had sliced roast beef, hamburgers, hot dogs, sliced chicken breast, and other goodies. Sounds tasty—until I tell you they were all sealed in little plastic bags and irradiated to kill any bugs. They had a shelf life of twenty years. Our meals were also freeze-dried and had to be reconstituted with water. It was government food, all right, but it kept us alive.

We were supposed to have some variety. Before the flight, we'd worked with a dietician to create a menu of freeze-dried items. She gave us a checklist and around three hundred samples, and asked us to check off what we liked and didn't like to create individual food menus. It sounded wonderful to me, so I worked through the samples and rated them all.

Two weeks before the flight, Jim and I were in our office and decided to compare our menus. They were exactly the same. That's peculiar, we thought. So we found Dave and compared his list. Identical, too. Puzzled, we tracked down a member of the Apollo 14 crew. Same result.

We contacted the dietician, who confessed that if one person didn't like a choice, she took it off everyone's menu. What was left is what we all got. So much for variety.

Still, the food wasn't *too* bad. Our bags were color coded: mine were white, just like my Corvette, while the other guys had red and blue. Once I had a food bag, I'd squirt in some water using a little water dispenser. In a stroke of genius by the spacecraft designers, the water was a byproduct of our fuel cells that powered the spacecraft's electrical systems. I was drinking the exhaust fluid of our batteries, which in turn supplied the power to the water dispenser. Nothing was wasted, and we even had a choice of hot or cold water. I'd push the dispenser into a little nipple in the corner of the bag, and give it a squirt. For a meal, I'd normally have four to five bags at once: a drink, soup, a main course, and a dessert. Each took about twenty minutes to reconstitute once I put the water in and mushed it up a little. So I left the bags while the water soaked in, and in the meantime they floated away. Since we usually ate at the same time, the spacecraft was soon full of color-coded bags which tumbled and drifted as if they had minds of their own.

Because the air in the spacecraft slowly circulated, we didn't have to worry too much about losing a bag. Eventually my food would drift by and I'd grab it out of the air, cut the top off, and eat the contents. I started to imagine if we all stayed completely still the bags might drift around the inside of



the spacecraft in a perfect oval. I could picture lying in my couch, plucking bags out of the air as they marched past in perfect procession, then releasing empty bags back into the air current. At the end of our meal, I could hold up a net and all of our trash would neatly float inside. It would have been fun to watch, like something out of Disney's *Fantasia*. The reality was more chaotic, but no less fun.

There was nothing to clean up after the meal. We simply folded the bags inward, then stowed them inside a trash bag. No washing up meant more time for other tasks.

Karl Henize, who had been so much help readying me for the mission, called up and asked, "How's the view out there?"

I looked out of the window at the shrinking Earth. Even though I could see the curved horizon, from orbit Earth had seemed mostly flat. Now we were far enough away that Earth looked like an enormous sphere. It looked *phenomenal*. I could see oceans, clouds, and familiar landmasses. The clouds were piercingly bright as they reflected the sun, much brighter than how we see the moon from Earth. And the oceans were a deep, seemingly bottomless blue. The brightness and intensity is something photos cannot capture.

Although our planet is thousands of miles across, the atmosphere is only fifty miles thick. It is one thing to read that but quite another, believe me, to see it with your own eyes. The horizon was paper thin. There seemed to be nothing that separated the surface from the deep blackness of space. Earth looked very vulnerable, in a way I had never understood before.

There were times I could see North America, glimpse the outline of Florida, and in my mind's eye I could zoom in to Galveston and Houston, even right down to the street where I lived. But it was all in my imagination. It felt weird to be so far away, and not be able to distinguish anything clearly. It all blurred into one landmass.

"It is fantastic, Karl," I replied wistfully. "You ought to be here, man."

"I'm eating my heart out," Karl responded, and I knew he meant it.

Fourteen hours into the mission, we wished mission control a good night and prepared for sleep. We were already out of our spacesuits, which we'd carefully stowed under the couches with their arms and legs folded in. One tear in those suits and the moon walks were canceled, so we treated them with reverence. Our lives depended on them.

It hadn't been easy taking the suits off in the spacecraft while we floated around, but we helped each other and managed the task without brushing against any switches. We still had on our long johns, and if we wished, we could wear cloth flight suits, too. Without the spacesuits it felt cool inside the spacecraft, so we each had a sleeping bag. We placed metal shades over the windows to block out the glare of sunlight. Jim took his sleeping bag under the couches while Dave and I stayed above. I tied my bag between two spacecraft struts, floated inside, and drifted off to sleep.

My stomach knotted and my arms flailed. I was falling from a great height. In terror, I snapped awake. Just a dream. I was okay. I fell asleep again, only to snap awake once more. What was going on?

The sleeping bag zipper only came up to my neck. I didn't need a pillow in space, so my head and neck were totally unsupported. As I slept, I moved a little. My confused inner ear told me that I must be falling and jolted me awake. I wasn't adapted to weightlessness yet. I unzipped my sleeping bag a little and stuck my head inside, where my shoulder had been. Now snugly cradled, I drifted off into a deeper sleep.

I woke up many hours later with a painful backache. What had I done to myself? By stuffing myself in my sleeping bag, had I hurt myself? I looked over at Dave, who was already awake, and asked him. "No, that's normal," he said with a little smile. "Your spine stretches in space, and your back hurts at

first. Guess I forgot to tell you that.”

I didn’t have time to ponder Dave’s humor. It would be another busy day. While we slept, engineers on the ground continued to troubleshoot the faulty switch problem, and Dick Gordon headed to a simulator to test procedures for an engine burn. We started discussing the day’s plans with Houston over the radio. They wanted us to try a test burn, to confirm what they thought was wrong. They read up the instructions to us, which we carefully wrote down. It now took about a second for our radio signals to get back to Earth, even at the speed of light, and the delay on the radio was noticeable. Boy, we were far from home.

Joe Allen was serving that morning as CapCom, the astronaut communicating with us from Houston. He started to read a pompous message from President Nixon. If Nixon hadn’t been slashing NASA’s budget that same year, I may have given his words some more consideration. And if I had to suffer through them, then so do you.

*“Apollo 15 is safely on its way to the moon—and Man is on his way to another step across the threshold of the heavens. Man has always viewed the heavens with humility, but he has viewed them as well with curiosity and with courage; and these defied natural law, drawing Man beyond gravity, beyond his fears, and into his dreams, and on to his destiny ...”*

There couldn’t have been a better time for us to have a minor communications glitch. Sadly, it was brief, and Joe soon continued wading through the president’s message. There was no escape.

*“... The flight of Apollo 15 is the most ambitious exploration yet undertaken in space. Even as it reflects Man’s restless quest for his future, so it also re-enacts another of the deeper rituals of his bones, not only the compulsion of the inner spirit to know where we are going, but the primal need in Man’s blood to know from what we have come. We hope, by this journey, to know better the origins of Earth, the moon, and other planets. We hope to understand something more of the mysteries of God’s great work. And, in this seeking, we hope to understand more of Man himself. To the men of Apollo 15, for all men, I say Godspeed.”*

Godspeed, Mr. President. True, this was the most ambitious space exploration mission ever. But now I could get back to my relentless quest to ease my backache and take a piss. No, there was more. A message from Vice President Spiro Agnew. Thankfully, his greeting was short, personal, and ended with best wishes for a successful mission. Much better—thanks, Spiro.

Back to work. Mission control had some more troubleshooting suggestions. We pushed on the instrument panel to see if the instrument light would come back on and help them understand where the short was located. No luck. So we then tapped on the faulty switch, and the light blinked on. Good—the problem was in that switch alone.

Joe also passed up some helpful advice from Dick Gordon, who’d finished a test procedure in the simulator. I would manipulate the circuit breakers to ensure the engine could not light accidentally, then burn the engine for just over half a second.

We were a little more than halfway to the moon when it lit. We felt a brief jolt of acceleration, and loose items floating in the cabin jerked downward. The burn worked perfectly and even gave us the exact little boost of speed we’d needed from our canceled midcourse correction. “Al Worden always did have a very fine touch on the circuit breakers,” Joe radioed after the successful firing. “Yes, sir,” Dave responded. “We call him nimble finger up here.” That got me laughing.

We wove science experiments around everything else we did, such as taking ultraviolet-light photos of the ever-shrinking Earth, but our next major task was to inspect *Falcon*. We had not entered the lunar module since we docked with it, and Dave and Jim needed to check it out. We purged and replenished *Falcon*’s oxygen supply, then removed the hatch between the two spacecraft for the first

time and floated it into *Endeavour* to stow beneath the couches. Dave and Jim drifted inside *Falcon* to begin work, and I followed not long after with a TV camera, so the ground could see what they were up to. It was tiny in there—barely room for the two of them—so I floated with my legs in the tunnel and watched.

Then Dave saw a problem. “The outer pane of glass on the tapemeter has been shattered,” he reported to the ground. This was *not* good. Some time during or after launch, the glass cover of an instrument had broken, and debris was drifting loose in the cockpit. “I’ve found one piece almost an inch in size,” Dave announced. But I was more concerned about smaller fragments. Jagged shards of glass inside a small spacecraft could float into the equipment, the spacesuit hoses, our eyes and our lungs. I could see floating fragments when the bright sunlight shone through *Falcon*’s windows and lit them up. Dave pulled out some duct tape and a vacuum cleaner and began to collect the debris before it could spread farther. However, he could only find “maybe 50, 60 percent of what was broken,” he told the ground, before it was time to head back into *Endeavour*.

While the ground puzzled over the glass, and another popped circuit breaker, we finished up for the day. I noticed that I was growing accustomed to weightlessness. I’d experienced the sensation before in the zero-G airplane, of course, but it was very different to live with it full time. At first I had overdone it when pushing myself away from a wall, not realizing the delicate touch needed. It was nothing like a swimming pool; I always felt conscious that I was floating free. I learned to grab parts of the spacecraft to help propel myself. To go under the couch, I would hold on to the front and curl my body right around and under in one movement.

Once I was used to moving quickly and accurately, it was fun to float down into the equipment bay, or up into the tunnel. Unlike Dave and Jim, who would walk around in the light gravity of the moon, I would float for twelve solid days. As my aching back and stuffy head gradually eased, I grew very comfortable.

As well as gravity, I had also lost any sense of day or night. These concepts meant little out there in deep space. I felt no sense of motion either. Earth shrank and the moon grew, but it seemed more like the Earth moved away, not us. Earth shrank so slowly after the first few dramatic hours, it was hard to notice the change. We passed through silent, empty space with nothing going by the windows. No street signs, telephone poles, or trees—as if we were motionless. I could only measure our speed by looking at the instruments.

I could see the bright sunshine of day and the deep black of night—both at the same time. As our spacecraft rolled in barbecue mode, the moon and Earth passed by in the windows, both too distant to create sunrises or sunsets. We created our own time. We were fortunate, because we could stay on Houston time for the whole flight. We’d work their workday, eat meals when they ate, and sleep when they slept. The shades in the windows while we dozed helped to maintain this illusion, while the sun beat relentlessly on our rotating spacecraft.

Time for another meal before we slept. I now felt comfortable enough in space to play with my food. Soup was particularly interesting. On Earth, if I dipped a spoon into soup, it would stay in the cup of the spoon due to the pull of gravity. In space, the soup clung to the spoon in a large ball, held there by surface tension. It didn’t care which side of the spoon it was on. If the soup was too hot, I would let the spoon go until it cooled down. If the ball was too big and I didn’t pick the spoon out of midair very carefully, the soup would break off the spoon and form its own little planet in the middle of the spacecraft.

Overconfident, I pulled out too much tomato soup. It broke free of the spoon and floated, quivering a little in the air currents, a perfect crimson sphere. After our short circuit problems, the last thing I

needed was a ball of soup floating behind an instrument panel. I imagined the headline: “Moon Shot Canceled Because Astronaut Played with His Food.” I briefly considered finding a straw and sucking it out of the air. But what if it broke apart into tinier balls of soup? I’d only make the problem worse. So I grabbed a towel. Sensing the air current from the approaching cloth, the soup quivered and moved away as if fleeing in terror. But it stood no chance. The towel engulfed the soup and quickly absorbed it. Good-bye, planet soup. I’d just wasted a clean towel, and some good dinner.

I looked again at the tiny Earth in the window, which looked smaller than my soup ball, before I blocked it out with the shade and headed for my sleeping bag. I felt space adapted enough to leave my head out this time. I slept wonderfully.



## CHAPTER 9 EARTHRISE

“We certainly did have a nice sleep,” I reported to Joe Allen shortly after we woke for the third day of the mission. “The moon is getting bigger out the window.” I could see small details with my naked eye, such as little craters I had never glimpsed before without a telescope. The moon was bright and not quite half full. Dave and Jim needed to arrive at their landing site while the sun was still low. Any higher and it would be too hot for their surface equipment to function safely.

The three of us now looked a little scuzzy. None of us had shaved, and we wouldn’t for the entire flight. We were explorers. Have you ever seen a picture of an explorer without a long, straggly beard? We planned to embody that adventurous spirit.

We also decided not to wash. That was fine, because we didn’t need to. We were in the cleanest environment possible—a spacecraft assembled in a spotless room. Our air-conditioning system scrubbed out most of the odors. Jim had brought along a bar of soap, but not for washing. We put the soap inside a wet rag and whirled it around to make the cabin smell nicer.

I did, however, brush my teeth. Plus, of course, we all had to pee and take a crap. Just because we were away from Earth, that urge didn’t change. However, we had a challenge—in space, everything floats.

Peeing was relatively easy. The urine collection device was shaped like a condom, connected to a tube that fed into a plastic bag. Opening a valve, I could flush my urine out into the vacuum of space, where it froze into thousands of crystal flakes. I preferred to perform a urine dump right before we fired our engine. Otherwise, without any other gravitational attraction, the snowflakes surrounded our spacecraft in a large cloud. If I tried to sight stars through the navigational system, I might aim at my own urine and think it was a star. Firing our engine moved us away from the cloud, which, for all I know, is still out there, our personal contribution to the solar system.

Taking a crap was more primitive. We used plastic bags with a six-inch opening, surrounded by a circle of sticky tape. We’d roll down our long johns, slap the bag on and go. Then we’d wipe ourselves and throw in the used tissue, seal the bag, knead germ-killing liquid into the whole mess, and roll the bag into the smallest possible shape. We’d write our name and the flight time on it and float it to a container that held all these gift-wrapped goodies. Later, some lucky doctor back on Earth would get to work through them all.

Three of us shared this tiny space, so there was no privacy. On an earlier moon flight, one crewmember had tried to hold it in for six days and got pretty sick. It wasn’t pleasant to have someone float inches from your face with a bag stuck to his butt. That fragrant bar of soap was a welcome antidote. But we were grungy explorers and we didn’t let it bother us or give it a second thought.

Back to business. Mission control asked Dave and Jim to carefully vacuum the surfaces inside *Falcon* where glass may have stuck, and then leave the vacuum cleaner running in there to catch any additional floating shards.

Before that, we carried out an unusual experiment. Each of us had seen bright flashes when our eyes were closed, and so had crews before us. Scientists believed these flashes were cosmic rays whizzing through space and passing through our heads. We placed the shades in the windows, put on eyeshades, and reported how many flashes we saw in an hour—and there were many. The effect was like flashbulbs going off across a crowded sports stadium as these high-energy particles zapped through our skulls. We reported the many directions the streaks of light seemed to be coming from. Were they striking our retinas or hitting a deep part of our brain, activating our visual senses there? We didn't know.

We were close to the end of our day's tasks when Dave announced to Houston that we had another problem. Down in the equipment bay, Jim spotted the outlet for our water supply leaking right around the cap. In weightlessness, a wobbling ball of fluid grew around the leak, while water also slowly crept across the surrounding surfaces. This was *not* good. Had a pipe broken? Would we be able to stop the leak?

Karl Henize asked a question from the ground. "Can you give us an estimate of how many drips per second?"

Jeez, Karl, I thought, we're in space. Water doesn't drip in weightlessness. But we worked through this brief confusion. NASA engineers and contractors around the country began to look for a solution.

"It's accumulating at a pretty good rate," Jim informed Karl with a slight note of alarm. If this water floated into our electrical systems, there would be hell to pay. Following instructions from the ground, we begin to turn off pressure regulators and tank inlets, hoping to stop the leak. We also began to soak up the growing water sphere with towels.

Within fifteen minutes, Houston radioed a solution. I later heard they tracked down a technician who was on his way home, and he knew exactly what to do. We pulled out the tool kit, tightened the fitting, and the leak stopped. If it hadn't, we would not have landed on the moon. It made me think, as I floated there, why it was important to send people into space. A robotic spacecraft couldn't fix itself.

"Nice to have the quick response ... we about had a small flood up here," Dave radioed with relief. It was teamwork at its finest. Mission control later told us that Captain Cook's *Endeavour* had also sprung a leak on one of its voyages, which made us feel even more like grizzled explorers. "You guys didn't strike a coral reef there, did you?" they joked with us. "Sounds to me like the *Endeavour* has a few plumbers aboard."

The plumbing work had made me thirsty. Surrounded by wet towels, I decided to make a hot coffee. I had three kinds made up for me on the flight: black, black with sugar, and black with cream and sugar. If I couldn't have a slug of the Oso Negro vodka I'd hoped to sneak aboard, a jolt of black coffee would be the next best thing.

Instead of coffee, Jim and Dave had loaded up their drink menus with hot chocolate. I'd warned against it. Sweet and sticky, it was sickly, nasty stuff for a spaceflight. Interestingly enough, I hadn't seen Dave or Jim drink much of it so far. And, looking at my meager coffee supply, I noticed the number of packages was going down awfully fast. I'd need to protect my supply before they drank it all.

Although there was no sense of it in the spacecraft, we'd slowed down from twenty-five thousand miles per hour when leaving Earth orbit to a relatively sluggish three thousand miles per hour. Earth

continued to pull on us. But now the moon's gravity tugged more strongly on us than Earth's. As we fell toward the steadily growing moon, our speed began to pick up again.

We would reach the moon the next day. It was time to sleep. I felt so comfortable in space now that I didn't bother with the sleeping bag. Instead I flattened out my couch, put a strap around me so I wouldn't float into the instrument panel, and slept.

All too soon, it was morning. Time to put my spacesuit back on—just as a precaution. It was a lot easier putting it on in space. I simply let the suit drift in front of me and floated into it.

We prepared to jettison the door covering the SIM bay. Better to do it now, we reasoned, than in lunar orbit, in case it hit the large engine bell at the rear of the spacecraft. This operation was a first for the Apollo program, which is why we suited up. That door was a hunk of metal five feet wide and more than nine feet long, and we were going to release it with explosives.

After another quick course correction burn, we blew off the door. I felt a faint shudder through the spacecraft as the explosives fired and the panel slowly tumbled away. The detonation jolted a thruster valve closed, but we quickly reopened it from the control panel. My bay of prize experiments was now exposed to space, ready to whirl into action when we reached lunar orbit.

"You'll be interested to know that there's a very thin crescent moon in front of us," I told Houston. "It may be thin, but it's big."

The sunlit part of the moon had shrunk to a delicate sliver. And in the faint reflected light from the distant Earth, the rounded bulk of the shadowed side loomed at us as we approached. For the first time, I could see that the moon was truly three-dimensional. It was eerie.

Less than an hour before arrival we dropped into its shadow. Picking up speed, we fell toward the moon's western edge as its dark mass grew in our windows. We turned the spacecraft so our main engine faced forward, ready to slow ourselves into lunar orbit. We'd make that engine burn behind the moon.

"Have a good burn," Karl radioed as we prepared to lose our radio signal.

"We'll see you on the other side," Dave replied. Then we lost them.

We hurtled behind the moon for eight minutes, then lit our engine. It was a beautifully smooth and precise burn. For six long minutes we slowed down, gently pressed into our couches, curving our path so that we fell around the dark surface: not too close, not too far. "Looks like it's running smooth ... Holding steady," I told Dave and Jim as I monitored the engine thrust. We were ready to intervene if the burn didn't end at the correct moment. But it did. "Shutdown. Fantastic!" Dave announced. We were in lunar orbit.

Mission control, of course, had no idea that our burn had been successful. All they could do was wait for more than half an hour to pick up our signal as we rounded the moon's eastern limb. If they acquired us early, that would mean our burn hadn't been successful and we'd be hurled away from the moon, back toward Earth.

We curved around the moon's far side, intensely studying our instruments. Then, out of the window, I saw what looked like a series of ghostly ocean waves coming toward me from the deep blackness. This was weird, and unexpected. What was I seeing?

The waves seemed to billow and grow as my confused mind tried to make sense of the glowing, shifting patterns. Then I slowly began to comprehend the sight. Sunlight was hitting the top of the tallest lunar mountains as we passed over them, and the peaks were separated by deep black shadows. As we continued to round the moon into sunlight, the shadows grew thinner, and I could begin to make out surface features.

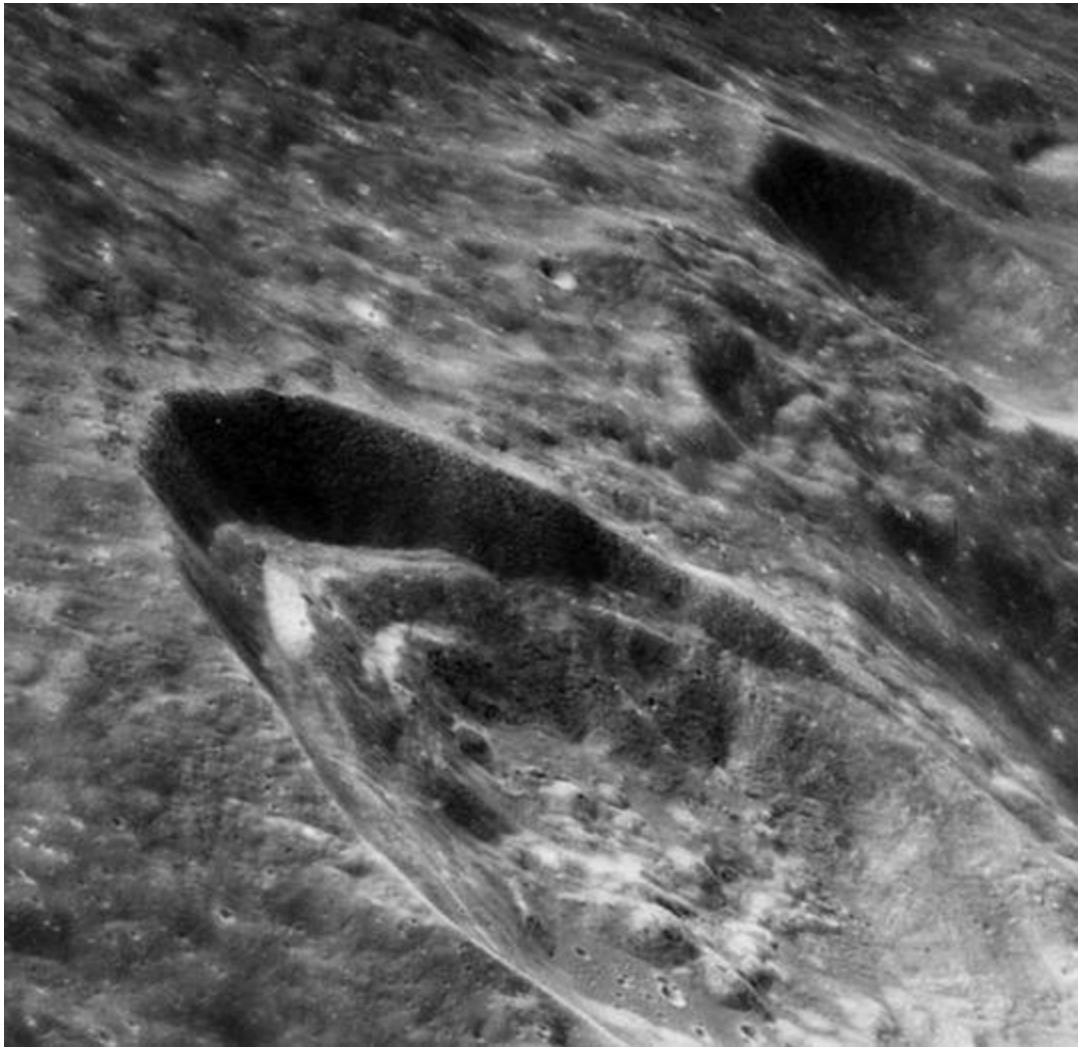
Even after the years of training, I never expected the moon to look this eerie and dramatic. After

days of falling through empty space, I was vividly aware of how close we were to this immense landscape. It felt scary to be grazing over mountains and valleys which now filled our windows with an ever-changing drama. I'd never understood the word "unearthly" before, until I was somewhere that was literally not this Earth. This place was *different*.

We rounded the far side in 34 minutes and reestablished contact with Earth. We'd reacquire and lose them every time we circled the moon. "Hello, Houston, the *Endeavour*'s on station with cargo, and what a fantastic sight," Dave reported. "Oh, this is really profound, I'll tell you—fantastic!" Dave's fascination with geology was kicking in, and he was overwhelmed by the vistas below us.

The moon looked ancient, battered, pockmarked—and dead. I didn't feel a sense of foreboding, but of lifelessness. Compared to our beautiful Earth, I didn't feel there was anything here that would support humankind.

Our Saturn V third stage had trailed us all the way to the moon. Now, out of our view, it slammed into the lunar surface and gouged out a fresh crater. The shock from the impact sent an earthquake-like ripple across the moon, picked up by seismometers left by the Apollo 12 and 14 crews. Our first surface experiment was complete, and we'd literally changed the face of the moon.



*The magnificent lunar surface from orbit*

Compared with prior missions that circled comfortably near the lunar equator, we were in a strange, complicated orbit. It took us much farther north into unseen territories, and Dave continued to report with both geological precision and wonder as we skimmed over regions no human eye had



ever seen this close. He was in his element. Why choose between being a spacecraft pilot or an observational scientist? From our first moments in orbit, Dave showed that a good commander could do both.

With no atmosphere to soften the lunar features, they looked disturbingly close and sharp. It was the same moon I knew from photos in my training, but when it filled my window it looked strikingly different. Seeing a dark circle on a map is abstract, but skimming across that same five-hundred-mile-wide basin in person was *real*. The variety was fascinating: faults, swirls, wrinkles, powdery dustings, and features that looked weathered by Earth-like oceans and dust storms. Rivers of ancient lava rippled across the barren plains. I reported with excitement on subtle surface flows, patterns, and variations in colors and shades. “After the King’s training, it’s almost like I’ve been here before,” I remarked, using our nickname for Farouk.

The shadows lengthened again, until only mountain rims remained to catch the sunlight. We kept reporting until we sped into shadow once more. The ground radioed that Farouk had been listening in and was delighted with our descriptions so far. Then, once again, Earth slipped below the horizon and we were on our own.

We burned our engine once more, which dropped us into a lower orbit. “Man, it already looks like we’re lower,” Jim remarked, as lunar features zipped by. He was right—it felt as if we were diving toward the surface, and mountains ahead of us looked unnervingly higher than our flight path. The lowest point of our orbit was now less than eleven miles above the surface and coincided with passing over the planned landing site. Some of the mountains around that zone reached up fifteen thousand feet. I stayed *very* aware of our altitude as we slid around the moon, documenting the uncharted regions with photos and words. As we sailed toward the highest peaks, I almost felt like pulling my feet up.

Dave and Jim would land on the moon the next day. As we ate dinner, Jim was making plans. “I think the first thing I’m going to do when we get back,” he explained, “is a beautiful night in Tahiti.”

“Hey, you’re on, buddy, you’re on!” I replied. But I knew what he was really saying. Tomorrow would be a risky day for Jim. By planning ahead, he was telling me—and himself—that he would survive the mission. It was a good idea. But I momentarily thought of those old World War II movies, where the guy tells his colleagues how he is going to marry his sweetheart when he gets home. He always dies in the next reel.

Mission control woke us early the next day informing us that, while we slept, our orbit had dropped faster than predicted. Denser parts of the moon, called “mascons,” pulled harder on the spacecraft as we passed over them. Flying over unexplored regions, we found mascons the hard way. Taking the shades off the windows, I looked out with alarm as we passed an immense lunar mountain. It looked like the peak was *above* us. I could clearly see small boulders littering its side, although that might have been because my eyes were wide with alarm. How low were we? We were planning to land on the moon today—but not by hitting a mountain.

Mission control gave us the figures. We had dropped down under forty-six thousand feet. Phew, we were okay, still three times higher than the mountains around the landing site. I realized the spacecraft was tilted at an angle when I’d looked out the window, so the surface only appeared to be sloping above us. But boy, those boulders looked so close. I felt like I could reach out and touch one.

Another few hours, and that might have been true. Mission control calculated that we would drop even farther as the day went on, and their margin of error was getting too close to the top of those peaks. By the time we were over the landing site, we might be as low as twenty-four thousand feet and falling.

“You can see how, when you’re coming up at low altitude on these mountains, how striking they are in the distance,” I told mission control. “It’s really hard to miss them.”

“I *hope* you can miss them!” mission control joked in reply. But they had a serious point. We pulsed our thrusters and raised our orbit a little.

It was an extra task in a day that was already packed. Dave and Jim headed into *Falcon* as early as possible to prepare for their lunar landing and were soon busy ensuring there was no broken glass in their spacesuit hoses.

We were fast approaching a vital moment in the mission: our two spacecraft would undock. The ground informed us that Neil Armstrong was watching from the mission control viewing area, while lunar module hotshot Ed Mitchell took over as CapCom. Ed began reading and confirming precise data sequences to us. We floated back into our spacesuits, updated the lunar module’s guidance computer, tracked landmarks, and equalized spacecraft pressures. The computers in both spacecraft were too primitive to talk to each other, so we had to manually enter information so that they agreed on where we were and how fast we were orbiting. Dave raced ahead on the timeline, keen to get everything prepared. It took hours and drew on some of our toughest engineering training.

It was time to lock the hatches between the spacecraft. We were so engrossed in our work that there was never a moment to pause and say good-bye and good luck. I guess we didn’t need to. Dave and Jim relied on me to keep *Endeavour*, our only ride home, in lunar orbit for them. I had confidence they would survive their ambitious lunar surface explorations.

I hit the switch to separate the spacecraft. Nothing happened.

Our instruments suggested that an umbilical in the docking tunnel was not properly connected, halting the signal to operate the latches connecting the spacecraft. So I hurriedly floated back up into the docking tunnel and opened *Endeavour*’s hatch. If the spacecraft separated now, I was dead. I’d be shot out like a cork from a bottle as the oxygen in the crew cabin emptied into space.

I found that the umbilical cord was loose in its socket. So I unplugged it and rammed it back in. That should do it. Then I locked the hatch again and floated back into my couch.

I hit the switch again, and the two spacecraft gently slid apart. “You’re on your own,” Jim radioed to me.

I looked out of the window as we flew in formation. *Falcon* hung above me, its coppery sides glinting in the sunlight. The spidery spacecraft looked scarily fragile out there in deep space. “You’ve got four good-looking gear,” I told Dave, confirming that their landing legs were fully deployed. They continued to busily check out their spacecraft for their descent to the surface.

I prepared to burn *Endeavour*’s engine again, to raise me into a sixty-mile circular orbit and leave Dave and Jim behind. Without *Falcon* attached I was much lighter, and I really felt the acceleration when the engine lit. “What a kick in the tail!” I radioed to Dave. I zoomed behind and above *Falcon*, leaving them to land.

But it was more than a kick in the tail. I had my heart in my throat. We had removed the center couch so Dave and Jim could easily float into *Falcon*, but I had not put it back. This meant that there was nothing to stop my own seat on the left side from shifting on its supporting strut. When the engine lit, my couch swung toward the middle of *Endeavour*, away from my instrument panel. To my alarm, I realized I could no longer reach the controls.

I held on and hoped the computer was performing the burn correctly. If I needed to reach over to shut it off, I’d be in trouble. Within a few seconds as the acceleration peaked, I could swing the couch back and reach the instruments again. But it had been a scary moment.

Meanwhile, Ed Mitchell gave Dave and Jim the call—*Falcon* was *go* for powered descent to the

surface. We'd taken five days to get to this moment, and their landing would only take another twelve and a half minutes. I'd come almost the whole way with them so far, but now they would make this brief journey without me.

It felt odd to see them grow smaller, until they were just a speck against the lunar background. I shot way ahead and quickly lost sight of them. But I listened to Ed, Dave, and Jim on the radio as *Falcon's* descent engine fired and the lunar module dropped through the mountain range toward their Hadley Rille landing site. Minutes later, I heard Jim shout "Bam!" *Falcon* had thumped down firmly onto the lunar surface. I smiled in relief. They had made it.

"Okay, Houston, the *Falcon* is on the plain at Hadley," Dave announced. I grinned. The Plain was the name of the parade field back at West Point, and I knew Dave had just named the landing site as a tribute to our academy.

President Nixon issued another message. "The president sends his congratulations to the entire ground team and the Apollo 15 crew on a successful landing, and sends his best wishes for the rest of the mission." Boy, he got that message out to us fast.

"Houston, this is *Endeavour*. Thank you very much," I responded. Thank you, Mr. President, for keeping it short this time.

And then I slipped around the back of the moon once again. This time, I would be completely alone. A quarter of a million miles away, planet Earth was home to all but three humans. Two of them, Dave and Jim, were now two thousand miles away on the other side of a big, dead ball of rock. And then there was me. With the moon in the way, I couldn't talk to Dave or Jim, or Earth. I was the most isolated human in existence. I'd be on my own for three days.

It would have been great for all three of us to go down to the lunar surface. It was an exciting time for Dave and Jim, and it would have been fun for me, too. But I was happy where I was. In fact, it was my favorite part of the flight; I had that amazing spacecraft all to myself. We'd been cooped up together so closely, I enjoyed stretching out. Plus now I *really* got to fly. Like a test pilot checking out a new airplane, I would gain stick-and-rudder time in this enhanced version of the command and service module.

I didn't feel lonely or isolated. I'd grown up able to take care of myself and had become a single-seat fighter pilot. I was much more comfortable flying by myself than with others. In fact, I most enjoyed the back side of the moon, where Houston couldn't get hold of me on the radio. I was fascinated by what I was seeing and happy that Dave and Jim had landed safely—but glad to be rid of them for a while, too.

I was also going to be intensely busy. I was my own solo science mission now, with my own CapCom so my work was not confused with Dave and Jim's. I'd already begun turning on some SIM bay instruments as soon as we were in lunar orbit. But now, with *Falcon* gone, I could really focus on my science tasks. I turned the spacecraft to aim the SIM bay at the lunar surface.

I had a meticulously choreographed three days ahead of me. The spacecraft would be in sunshine, in shadow, in and out of radio contact with Earth. I needed to use the sextant, the windows, and the SIM bay, each of which would need to be pointed in different directions for different tasks. But I couldn't just turn the spacecraft any time I felt like it: my fuel was precious, and finite.

I extended the mass spectrometer on a large boom, trying to sniff out any hint of lunar atmosphere or escaping volcanic gas. Scientists particularly thought that areas of lunar sunrises and sunsets might concentrate stray gases. They would be extremely tenuous, and that is where we ran into trouble. The spectrometer mostly picked up particles that we brought from Earth. We'd sprayed clouds of urine along our flight path all the way to the moon, and these urine dumps continued in lunar orbit. My

frozen pee is probably sprinkled all over the moon. Add rocket engine exhaust, and it is no wonder our mass spectrometer had trouble finding anything else.

In another effort to get away from the effects of the spacecraft, I also deployed the gamma-ray spectrometer on a large boom, to search for radiation emitted by the lunar surface. I activated other instruments to look for X-rays, plus alpha particles such as radon which volcanic cracks in the moon might emit. If I found them, it could reveal activity deep inside the moon. I even bounced the spacecraft's radio signal off the moon and back to Earth, which gave us more details of the surface composition.

I often needed to control the spacecraft to keep it steadily curving around the moon, so that the panoramic camera could look straight down and take clear shots. If I were out of place, the camera would only capture blurry photographs as the landscape sped past below. I was flying over uncharted parts of the moon's far side, so I wanted to get great shots.

The camera was a modified version of the device used by the U-2 spy plane and air force spy satellites. It was now obsolete, so NASA could use it. That camera was a phenomenal instrument—the lens and film moved together in one precise motion to image a huge swath of landscape. Using more than a mile of film, I took over fifteen hundred photos, capturing details only a few feet across. When we returned to Earth I found I'd even captured the shadow of *Falcon* on the moon and the disturbed lunar dust around the spacecraft where Dave and Jim had walked.

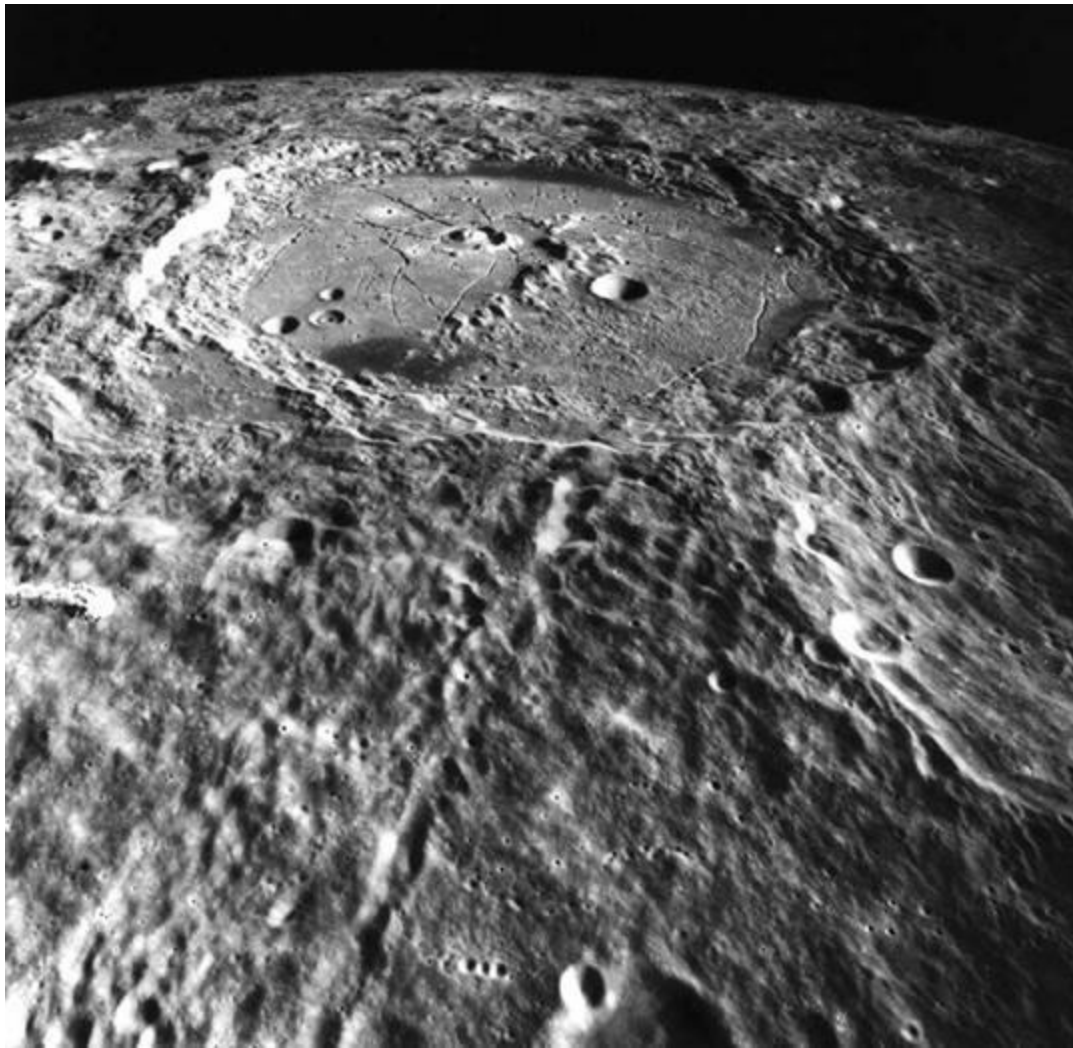
The military had placed one condition on our use of the camera. So there was no question of any international incidents, I was prohibited from pointing it at the Soviet Union. This was nonsense—from a quarter of a million miles away, the best image I would have captured was a fuzzy continent. But it had been a spy camera, so the diplomats had to be satisfied.

Another device, the mapping camera, rose out of the SIM bay on rails. I used it to snap precisely measured images of smaller patches of terrain. Using a star-seeking camera and a laser beam that bounced off the surface, I could match every photo with the exact angle and distance from the landscape. Shooting stripes of overlapping photos, I mapped the moon as explorers of old had mapped the earth. As my orbit shifted slightly westward with every revolution, I mapped a new area on each pass.

I kept on a precise, intensely busy schedule to open and close lenses and shutters, deploy and retract booms, and orient the spacecraft. But there was more. I would also take scientifically valuable photos myself out of the windows.

The moon looked enormous from such a low orbit. From Earth, I'd had no sense of its vertical features. Now as I zipped across the landscape I saw the outer rings of molten waves formed by meteor impacts frozen into gunmetal-gray mountains that reached fifteen thousand feet up toward me. I glimpsed tall central peaks of craters before I saw the surrounding low rims. As I constantly rounded a curved and angled surface, the tops of these hills would peek out over the horizon before I reached them, and once I passed over them the landscape would plunge thousands of feet in steep, shadowed crater walls. With no atmosphere to soften the view, every crater and boulder was sharp and crisp.

It was an alien world, but nevertheless it felt oddly familiar. Thanks to Farouk, every time I slid back into sunlight I recognized features right away. Craters, rilles, and overlapping, intermingling lava flows marched past that I knew from my training. I felt strangely comfortable—I knew this place.



*The moon was an alien world, but somehow reassuringly familiar.*

I wanted to see if I could spot Dave and Jim on the surface with my own eyes. I was not just curious: knowing their exact position would also help us dock three days later. Finding such a tiny object amid a plain of craters was not easy, but as I gazed through the sextant I caught a quick glint from *Falcon*'s shiny skin, then spotted their long shadow. "I've got the LM!" I announced to mission control. "He's sitting right by a very small crater." I rattled off their exact coordinates. "I hope the view is as fantastic down there as it is up here," I radioed down to Dave.

"I'm telling you, it really is!" Dave assured me. "We'll do the little things and you do the big things," he added, as I studied the grand sweep of the landing region from above.

"I think we're going to give lots of people lots of things to do for a while," I told mission control. The three of us would be returning massive amounts of data to analyze.

Changes in color and shading fascinated me as I circled the moon. Looking toward the sun, the lunar surface appeared light brown. Away from the sun, it looked gray. I saw white splashes where fresher craters had blown out flour-like rays of powdery soil. Although I know this could not be possible, the bright rays often appeared to be suspended above the surface in a lacelike haze, not scattered across the mountains. The moon looked bleached and desert-like when the sun was directly overhead, as if clay had been mixed with sand. Then, as the sun lowered, evidence of long-ago violent events would appear in the lengthening shadows of old scars and wounds from impacts. I could see lava flows so thick that they must have crept across the surface in a slow, widening, sticky wave, filling old craters as they wound across the moon. It was like a jigsaw puzzle of features, each

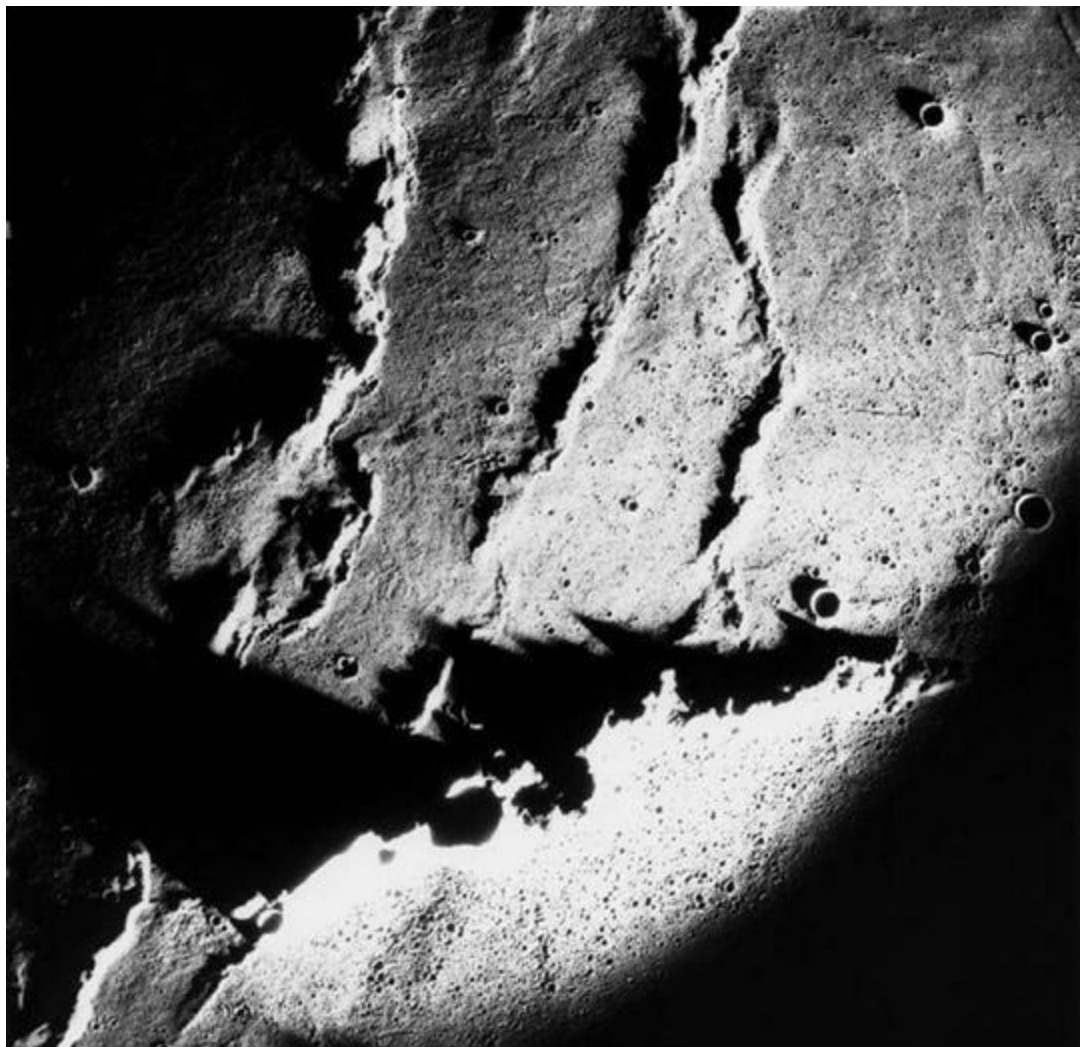
with its own secrets for me to piece together.

With no atmosphere, the line between day and night was strikingly distinct. Mountains cast long slashes of blackness across the landscape, and features stood out as if I had placed a flashlight against a rough stucco wall. I was fascinated by the starkness of the peaks. I loved to take photos in these shadowy regions—and not only because it helped the scientists. Back on Earth, they could use the shadows to measure the height of lunar features. But there was also a drama and beauty in these locations, and I concentrated much of my photography there.

Streaks of light would create alternating light and shadowy waves that once again stretched and seemed to billow and flutter as I curved into blackness. I felt like a sailor crossing a dark ocean. I knew photos could never capture what I observed. Neither can these words.

Once in darkness, I tried to take low-light-level photos of astronomical objects. With the moon cutting off light from the sun and Earth, the blackness was total. I would put my camera in the window and try for a ten-second exposure, using very fast film. It was tough to hold the spacecraft steady. I spent a lot of time working to keep *Endeavour* motionless, but in the end I decided it was impossible for more than a few seconds at a time. The spacecraft just wasn't that delicate to maneuver. But I still took some great photos.

*Endeavour* had one window with no ultraviolet shielding or any other protection. Made of quartz, it was absolutely clear. I'd been warned never to look out of that window without sunglasses or be caught in a direct sunbeam. It could have ruined my eyes and burned my skin. But that window was invaluable for photos when *Endeavour* was in complete darkness.



*I was fascinated by the dramatic long shadows where the sun was rising or setting on the moon.*

As I would be the first person to fly over the Aristarchus crater, scientists had asked me to study it closely. Astronomers thought they had seen reddish glows there, suggesting the crater was volcanically active. It was such a pale, smooth, almost mirror-like crater that even in shadow it looked as if it was gleaming in sunlight. “Looking at Aristarchus, a little bit in awe,” I later told Karl.

I didn’t see any glowing, but other instruments picked up possible traces of seeping radioactive gases. *Something* interesting was going on there. I hoped my measurements would help scientists puzzle it out.

Most of my observations grew out of my extensive training with Farouk. But the perception of human eyes allowed me to note subtle differences from Farouk’s photos and theories almost right away. For example, as I flew over the immense Tsiolkovsky crater, I saw that the enormous central peak was a little higher and the outside rim better defined than we had imagined. In photos, the smooth, lava-filled crater floor looked darker than its surroundings, but with my own eyes I could see that it was different only in texture, not color.

The crater was so vast that when I crossed it I could see little else. The central peak rose like a Swiss alp, a towering pale slab of rock surrounded by boulders hundreds of feet wide. Gazing closely, I could see details of rock layers no camera had ever captured. It looked like something had smashed into the moon eons ago like a stone into a pond, leaving a rippled crater, a smooth basin of lava, and a central peak rebounding out of the lunar depths. It reminded me of a bright island rising from dark, smooth waters.

Gliding over Picard crater, I could see delicate layers of lava, like rings on a bathtub, all the way down the crater walls to the bottom. They alternated between thin light and dark bands. This beautiful effect was hard to capture on camera, but I could observe with my eyes and describe it in detail.

The moon was overwhelmingly majestic, yet stark and mostly devoid of color. Every orbit, however, I was treated to the sight of the distant Earth rising over the lunar horizon.

In my entire six days circling the moon, no matter what I was doing, I stopped to look at the Earth rise. It was the most beautiful thing I had ever seen or imagined.

Our planet was the only place with color—distant blues, browns, and greens—all focused in one tiny globe. Ethereal and small, it shone in the deep black of space, much brighter than the full moon appears from Earth. Photos of Earth from the moon have a flat quality, but looking at it with my own eyes Earth felt alive and captivating. It seemed to beckon like a warm refuge. More than a gorgeous sight, it was home.

Earth had seemed limitless when I had walked out on launch morning. Now it was a faraway sphere, so small that it was hard to believe everything I had done, everything I had seen, had happened down there. I now felt apart from Earthly affairs in a way I can’t describe. Perhaps you have to go to the moon to feel it. But I could see that Earth was truly finite. That distant ball could only support so many people and contain so many resources. Once it is gone, it’s gone. If humans didn’t unite and organize their lives, I pondered, we’d be in trouble. Our parochial interests, whether religious, economic, or ethnic, are all best served by trying to keep our tiny island in space livable. In fact, to live any other way suddenly felt like insanity to me.



*I never grew tired of watching Earth rise above the moon.*

It sounds cliché to write, and perhaps a little surprising coming from a military officer, but the experience was mind altering. And when I experienced the feeling for myself, I knew in my gut it was the truth. Ironically, I had journeyed all this way to explore the moon, and yet I felt I was discovering far more about our home planet, our Earth.

As the days passed I watched the Earth change phases just as the moon does from Earth. When I arrived, the Earth was about half full, but it gradually diminished to a delicate crescent. Only when I looked back at the Earth rising did I understand how far I had traveled. I was isolated, with only the radio to stay in touch. If I thought about it too much, it was almost a little scary—not the isolation, but the sheer distance. We had a long journey back.

Farouk and I had worked on something special for every time I saw the Earth rise. I'd noticed that, to the public, guys flying around the moon seemed kind of ho-hum, nothing exciting. How could I make it interesting? I talked about it with Farouk, and we decided the best way might be for me to say something interesting every time I came back into radio contact. We came up with a phrase that we thought might grab everyone's attention: "Hello Earth, greetings from *Endeavour*." Farouk wrote it out for me phonetically in nine foreign languages: Arabic, Chinese, French, Greek, Hebrew, Italian, German, Spanish, and even Russian. Along with English, I'd have ten different ways to say hello to the citizens of our planet and make the point that the Apollo program was for the whole Earth, not just America.

It worked. I tried to transmit a different variation on every solo orbit, and the world press paid a



little more attention.

I had brief opportunities each day to talk to Dave and Jim down on the surface. It sounded like they were toiling through an impressive science exploration schedule of their own. I could even look down into the deep rille while passing over the Hadley plain and see enormous rocks in the canyon at the exact same moment Dave and Jim were parked at the rim in their rover.

“Pretty spectacular up beside that mountain, I bet,” I asked Dave one time.

“Oh man, it was super, just super,” he replied. “We’ve got some great pictures for you.”

“I hope I’ve got some good ones for you, too,” I happily replied. It was great to hear from them.

But I guess Jim was feeling grungy from all that moon dust. “Hey, Al, throw my soap down, will you? And my spoon,” he radioed. “I really need my soap.”

“Don’t mind if I use it, do you?” I responded, teasing him a little.

“Save me a little bit!” he pleaded in return.

Dave and I then bantered about saving the soap until we were all back in lunar orbit again. The conversation was lighthearted, but once again we were reassuring ourselves that everything would go to plan. *Falcon* would lift off and rendezvous with me in space. We were going to survive and see each other again.

I looked for Dave and Jim every time I flew across the landing site. It was never easy to find them, and usually I only caught a quick reflection from *Falcon* before I lost them. And yet I felt closer to them than the people on Earth I was talking to all the time. It was reassuring to chat briefly every day and confirm I was still there for their return trip. “Save us some food!” Jim quipped as I sailed overhead.

While they were roaming the surface, I was hanging in weightlessness, so I needed to exercise. I had a small cylindrical device called the Exergym. A nylon rope wove through a series of friction pulleys, so when I pulled on it the friction created tension that I could exercise against. It was a great idea, but the damn thing didn’t work.

We hadn’t even reached the moon when the nylon started to fray. It heated up when we used the device and stretched the rope into useless threads. This was puzzling, because crews before us had taken it and said it worked fine. I suspected they hadn’t used it much.

I still needed to exercise, so I improvised. With the center couch removed, I could hold on to the two struts in the middle of the spacecraft and push against them. I could do knee bends and run in place with my legs freewheeling in air. I felt my heart rate rise and could watch the attitude indicator and see the entire spacecraft rocking back and forward.

I’d been looking at the Littrow region of the moon a lot, because scientists were curious about the darker soils there. Were they evidence of volcanic activity? On one pass, I spotted something unusual. “There are a whole series of small, almost irregular-shaped cones,” I reported, “and they have a very distinct dark mantling ... It looks like a whole field of small cinder cones down there.”

Unlike craters created by meteorites, cinder cones build up as debris is pushed out from a volcanic vent. I was seeing features that met the definitions I had studied.

“They’re somewhat irregular in shape,” I continued. “They’re not all round ... and they have a very dark halo, which is mostly symmetric, but not always, around them individually.”

Mission planners had told me I wouldn’t be able to see features that small. But that wasn’t true. If I stared hard at a fixed point, it was tough to resolve. But if I swept my eyes around the general area, I could pick up a lot more detail.

As I described these funnels surrounded by dark rings, the geologists back on Earth grew excited. So much so that the last Apollo lunar mission, Apollo 17, was targeted for the Littrow region. That

mission didn't reach any cinder cones. Instead they found an impact crater that had punched through the surface, throwing up an unusually dark ring of subsurface volcanic ash and bright orange glass beads. Good enough.

My work days were busy, but I was floating around so I didn't burn up much energy. The ground had assigned me seven or eight hours to sleep. I found I only needed three or four. It wasn't because I was nervous; it was more because I was excited. I had a lot to do. I didn't bother telling mission control I was awake. I used some of the time to finish up experiments and take photographs, but I also had hours of free time around the moon to just look out, marvel, and think.

I orbited alone in a detached, eerie silence, my spacecraft on a smooth trajectory. When I flew jets back on Earth, I was used to little bumps as I cruised through air and the roar of the engine. Here there was stillness and peace. It was more like riding in a hot-air balloon, drifting with no sensation of motion. I felt like an imaginary alien might when visiting Earth in a UFO, that this was not my planet. I was not from here, and perhaps not even supposed to be here. I was spying on an alien place.

The only noise came from pumps and fans running in the background, which I only noticed if something did not sound right. Just like driving a car, you only snap alert when you hear something unexpected. Since my life depended on this machine, I was hyperaware of unusual sounds.

Sometimes I played music, which only heightened my sense of eerie detachment. I had a cassette filled with songs by Simon and Garfunkel, The Moody Blues, Judy Collins, George Harrison, The Beatles, and some spoken-word extracts from James Cook's journals. Occasionally, I'd wind the tape to Frank Sinatra's "Fly Me to the Moon" and "Come Fly with Me" and hum along while I worked away on my experiments.

I would flip the cassette recorder and watch it lazily rotate while it played. It was odd to watch the laws of physics in action, as it would spin a couple of times, flip over, and continue to spin around a different axis. Space was *weird*.

I carried some songs by French singer Mireille Mathieu, who many called the successor to Édith Piaf. Her agent had contacted me to see if I would put some of her songs on my tape. I wasn't sure that would be a good thing, but I asked what he had in mind. The next thing I knew, her agent had booked the two of them on a flight to Houston to talk to me. I told the center director about these uninvited guests, and he arranged a meeting in his office, where we met with her for a few minutes. Out of politeness, I took a couple of her songs on the flight. They were hauntingly good but very sad, so I only listened to them once. The moon was foreboding enough.

I knew I would never be coming back to the moon, so I took extra care to absorb every sensation, every experience. I also believed that it was not just for me personally. With only two lunar missions left after ours, I understood it would be years before humans would return. I needed to experience it for everyone.

I curved around the moon to where no sunlight or Earthshine could reach me. The moon was a deep, solid circle of blackness, and I could only tell where it began by where the stars cut off. In the dark and quiet, I felt like a bird of the night, silently gliding and falling around the moon, never touching.

I turned the cabin lights off. There was no end to the stars.

I could see tens, perhaps hundreds of times more stars than the clearest, darkest night on Earth. With no atmosphere to blur their light, I could see them all to the limits of my eyesight. There were so many, I could no longer find constellations. My vision was filled with a blaze of starlight.

Unlike some other astronauts who had time only for hurried glances, I had many hours, spread over many days, to look at this awe-inspiring view and think about what it meant. There was more to the

universe than I had ever imagined.

It got me thinking about our whole concept of the universe. We can't see much of it from Earth, at least with the naked eye. The more we learn, through telescopes, the more our view of the universe changes. We can only make sense of what we can see. Viewing so much more now with my own eyes, I could feel my own understanding changing rapidly. I sensed that there was so much more out there than our Earthly philosophies would lead us to believe.

With hundreds of billions of galaxies in the universe, I decided it was naïve to believe we were the only life. If only a minuscule percentage of the blazing stars I saw had Earth-like planets, life could be everywhere. If our solar system is a natural process, then the rest of the universe should follow similar patterns. In fact, what if life came to Earth from somewhere else in the universe? My mind raced with possibilities.

Was the space program more than an engineering program—could it be part of our genetic drive? I might be circling the moon at that moment not because of politics or the Cold War, but because we are hardwired to explore space. In a few billion years, our own sun will die. Perhaps life wanders from star to star over the millennia, refusing to stay and die? Apollo might be the first step of that hardwired survival instinct.

I looked at the blaze of stars and imagined life out there as continuous, like seeds flying through the air, some surviving, some not. I imagined life spreading between the stars, timeless, always there, adapting, propagating, spurred by survival.

These feelings were amplified by the sensation of weightlessness. It seemed so natural, so comfortable—as if I were coming home. As if I had been that way before or belonged in space. Perhaps the natural state of humans was traveling through space.

I didn't come to any conclusions. I still don't know what is out there. What I strongly sensed was that we as a species have not yet experienced enough of the universe. Whatever we believe now is probably not accurate. We have developed our ideas based only on what we can see, touch, and measure. Now I was having a glimpse into infinity and could only dimly sense, not understand, the journey ahead for humans.

It was humbling for a Michigan farm boy, whose biggest worry at one time had been thirty acres of hay. Alone on the far side of the moon, in darkness, as far from other humans as it was possible to be, I drank in the experience, over days and long sleepless nights. Decades later, I'm still pondering what I absorbed in those intense hours.

Karl Henize tried to keep me grounded with world events each day. "President Nixon yesterday declared his administration is determined to revitalize the American country ..."

I interrupted him. "That's your world right now. Our world's up here right now, Karl." Then I gave him some more detail about ancient rock avalanches over the enormous cliffs of Tsiolkovsky crater. I could catch up on politics when I got back.

Then Karl relayed more personal news—that he and Vance Brand had visited my apartment across the street from mission control. Now *this* was more interesting.

"Your folks are there," Karl relayed, "and I guess, as you know, they've got a squawk box listening in on our loop with great interest. Except when you go behind the moon, then they watch the other show that's taking place on the surface."

That was good to hear. NASA had installed a device in my apartment so my parents could listen in to our conversations, including this one. I hoped they were enjoying themselves.

"They said to say hello," Karl added. "Great, very good," I replied. "Hello, folks!" A quarter of a million miles away, I imagined them smiling.

I looked in their direction. The crescent Earth was bright, the white clouds reflecting the sunlight perfectly. The moon below me was bright with Earthshine. It did not look the same as when it was bathed in direct sunlight. It seemed to glow with a ghostly radiance, like the pulse of a phosphorescent ocean.

I prepared for the sunrise. Faint streamers and tendrils of light arced above the lunar horizon, glowing gases from the corona around the sun. They were beautiful in their delicacy. Then, with an intensity that made me snap my head away, the white-hot glare of the sun rose above the moon.

I put the shades over the windows and settled in for my last sleep alone around the moon. It had already been the experience of a lifetime. We still had many days and adventures ahead until we'd find Earth once more.



## CHAPTER 10 FALLING TO EARTH

On my last morning alone around the moon, I woke to a breezy blast of mariachi trumpets. With the serene lunar surface gliding by below me, Herb Alpert's "Tijuana Taxi" was about the strangest music mission control could pipe up over the radio. But still, it got me awake. "Allo, Terre. Salut de l'*Endeavour*," I replied in French.

"You can expect that you'll have some company later this afternoon," Karl Henize told me. On the surface, Dave and Jim suited up for their final moon walk before they began preparations to lift off and rejoin me. We all had a busy day ahead—even if everything went according to plan. If not, it would be even busier.

My orbital path had drifted during my three days alone, so that I no longer passed over Hadley plain. I fired the engine for eighteen seconds to get back over the landing site. "It looks like a beautiful burn," Karl remarked, adding that he was also watching the television images of Dave and Jim exploring Hadley Rille. "Save a copy for me," I requested. I wanted to see it all when I got back to Earth. I glided over the landing site, noticing how much the sun angle had changed in the three days since they landed. The plain was almost in shadow when we arrived. Now the sun was much higher: the plain would be growing warmer.

The scientists following the SIM bay experiments were delighted with the data rolling in. But the equipment was slowly failing. The booms still extended, but began to stick when I retracted them, forcing me to pulse them in short bursts to come in all the way. A sensor in the panoramic camera also acted up, resulting in fewer good images, and the laser didn't fire as frequently as it should. For new and untried equipment, it had all worked magnificently, but it couldn't last forever.

Karl told me some exciting news from the scientists in Houston. The laser had measured the height of the mountains, and the X-ray data showed what the mountains were made of. The scientists had already compared the data. It seemed the highest mountains contained the lightest materials such as aluminum. Lighter elements rise in molten lava, so these results strongly suggested that the moon had once been largely a ball of hot lava. It looked like we had just made a major discovery about how the moon formed. Not only that, but it also meant that, unlike Earth, the moon had probably not changed much since it cooled. "It gets rather exciting when the data starts adding up like that," Karl added. "Lots of things are beginning to fall into place, and *what* a mission, that's all we can say!"

I was delighted we had solved a major mystery. To me, that discovery alone was worth the cost of our flight. But now it was time for some more piloting. Back in the lunar module, Dave and Jim prepared to lift off. Ed Mitchell, the lunar module expert, was back as CapCom for this critical time. He read up a blizzard of numbers to me, telling me where and when I would need to rendezvous with my moving target. But then I lost his signal. I thought he was done. For twenty minutes he tried to raise

me on the radio while, oblivious, I continued to prepare the spacecraft. With less than one minute to go before I slid around the moon and out of radio contact, Ed and I could finally talk again, and I hurriedly wrote down the last important numbers.

Dave Scott, alongside Neil Armstrong, had made the first-ever docking in the space program on his Gemini 8 mission back in 1966. Dave had refined the technique testing the first lunar module on Apollo 9. Now, around the moon, we'd use those proven techniques to dance a complex orbital ballet to find each other and link up once again. Instead of gradually catching up with each other after a few orbits, we would attempt a direct rendezvous. *Falcon* would launch, and *bam*, I'd snag them right away.

We're all set," Dave called from the lunar surface. "Ready to give us some warm chow? I tell you, cold tomato soup isn't too good." I guess he was fed up with the unheated food they had to eat in the *Falcon*, and was ready for the home comforts of *Endeavour*.

"You're go for liftoff," Ed radioed to Dave. "I assume you've taken your explorer hats off and put on your pilot hats?"

"Yes, sir, we sure have." Dave responded. "We're ready to do some flying."

Back in mission control, Joe Allen paraphrased some poetry by science-fiction writer Robert Heinlein. "We're ready for you to come back again to the homes of men, on the cool green hills of Earth." That sounded good to me, too.

On Hadley plain, *Falcon*'s engine lit, hurling Dave and Jim's spacecraft upward. They quickly pitched over and zipped along the rille on the curving path needed to reach me.

As they rose, I turned on the cassette player. We were an all-air force crew, so I figured it would be fun to play the air force anthem to mission control to provide a stirring background. Bad move.

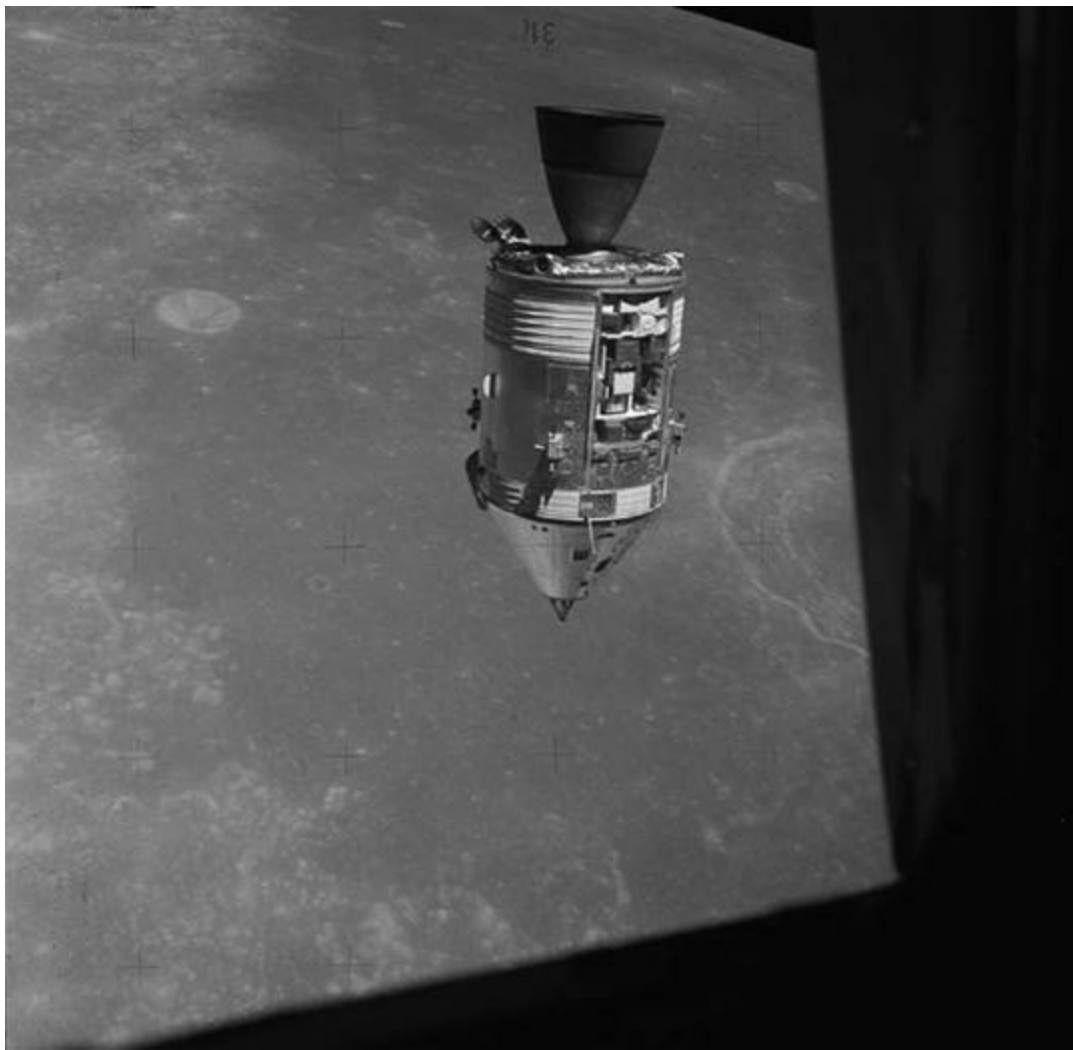
Perhaps it was related to the earlier communication problems and mission control was playing it safe, but my radio signal was not only heard on Earth. For some reason, mission control also patched it through to the *Falcon*. Dave and Jim, intently focused on their checklists, now had distracting music in their ears. The ground didn't tell me—perhaps they didn't realize what they had done themselves until later.

Had something gone wrong with *Falcon* at that moment, the music could have been a dangerous diversion. Fortunately, everything went to plan, and Dave and Jim zipped into an orbit below and behind me. I'd trained extensively to catch them if *Falcon* lurched into some other wilder orbit. But I never needed to. I soon had a good radar lock on them. Guided by Ed Mitchell back on Earth, Dave and I flew our spacecraft ever closer, mirroring each other's moves. "You got your lights on, Jim?" I radioed, watching for *Falcon*'s flashing tracking light.

I looked through the sextant and the telescope to try and find them, but sunlight in the scopes made it hard to see anything. Finally, in the corner of my eye, I spotted a flash of light in the telescope. I manually drove the instruments over to that point, and there it was—a very bright light. "I've got your lights now, Dave," I told them. Soon afterward, on the far side of the moon, Dave spotted *Endeavour*, a dim star in the distance.

"Oh, you're shining in the sunlight now. Boy, is that pretty!" I called as we grew ever closer. "I believe I can even make out the shape."

As *Falcon* steadily rose to meet me, Dave and Jim gave *Endeavour* an extensive look-over, while I photographed them in turn. *Falcon* had left its descent stage on the surface of the moon and was now much smaller than when I had last seen it. The lunar module appeared fragile before, but now it looked like I could reach out and crumple it with my fist. Glinting in the sunlight, it was painfully bright to look at.



*Dave and Jim get a good view of the SIM bay as we rendezvous in lunar orbit.*

*Falcon* was so light, a pulse of their thrusters rattled them around. So it was easier for me to dock using *Endeavour*. I slowly slid toward them, so gently that we barely touched. Then, with a touch of my thrusters, I pushed forward into a hard dock.

The rendezvous and docking had been fast, and perfect. “Good show, *Endeavour*,” Dave radioed to me. “Welcome home,” I replied. That might seem like an odd choice of words—after all, we were still a quarter of a million miles from Earth. But *Endeavour* had become my home, and Dave and Jim were returning from a great adventure. “The *Falcon* is back on its roost and going to sleep,” Dave added with a poetic flourish.

I’d kept our home clean and tidy for them. But now, as I opened the hatches between the spacecraft I saw two grimy faces. Their spacesuits were dirty, and I could smell the moon dust in the air. It was a new, peculiar odor to me, dry and gunpowdery. I kept the hatch closed as much as possible while we began to transfer equipment, hoping the floating dust would not spread. I was mostly successful, but the creep of dust was unavoidable. Dave and Jim floated long sample tubes of lunar dirt and boxes of moon rocks through the hatch, which I stowed inside *Endeavour* under the couches. Mindful of the new rules after the Soyuz 11 depressurization tragedy, we kept our spacesuits on.

While busily running SIM bay experiments, I also stored *Falcon*’s flight plans and checklists, food, priceless photos in film magazines, and—less priceless to me—Dave and Jim’s used urine and fecal bags. Of all the things to return from the lunar surface, did we really need their crap?

Finally, Dave and Jim floated into *Endeavour*. I was elated to see them. But Dave didn’t look

happy. In fact, while Jim looked away sheepishly, Dave began to loudly berate me about the distracting tune piped into the *Falcon* during liftoff. Didn't I know I had jeopardized the whole mission, he thundered, by playing that darn music?

This wasn't the reunion I had expected. I could only apologize and explain that I had only radioed it to Houston, with no clue they would patch it back to the *Falcon*. My explanation seemed to satisfy Dave for the moment. I guess he eventually forgave me, because months later at an awards ceremony with the Air Force Association Dave bragged about playing the tune.

There wasn't time for me or Dave to dwell on the argument. We had too much to do. Dave and Jim were busy ensuring they had moved everything in from the *Falcon*. But they missed some items. Some of their PPKs, including personal items they had kindly taken down to the surface for me, were overlooked.

We wouldn't discover that mistake for a long time. Behind in the timeline, we hustled to close the hatches and pressurize our spacesuits. Dave's suit did not pressurize properly on the first attempt, nor did the spacecraft hatch seal correctly, possibly due to some lunar dust on the seal. After more time-consuming checks, we finally seemed to have the problems solved, and Dave and Jim could remove their helmets and gloves. They had started their day with a demanding moon walk, and they hadn't eaten for eight hours. They were ready to stop for a while and grab some food.

Then it was time to finally undock from *Falcon*. "It's away clean, Houston," I reported as the lunar module separated with a bang. I felt sad to see it go; it was a magnificent spacecraft. Now it would be steered to a final crash on the lunar surface.

I was also acutely aware that we were now down to one engine. The big engine in the service module was our only way out of lunar orbit. So far, it had worked well, day after day. But if it stopped working.

No point thinking about that. The separation had taken longer than planned, so instead of our scheduled rest break, we jumped back into our chores, including some more SIM bay experiments.

Dave and Jim didn't seem weary to me, but it was hard to tell when we all had so much to do and were zipping around getting it done. I put Dave's slight ill humor down to his annoyance with me over the tune.

But then we heard a familiar, gruff voice over the radio, which only got in the loop when there was something important. "This is Deke," the voice growled to Jim. "I'd like to have you and Dave, at least, take a Seconal here before you go to sleep so you can really power down for the night. You guys need it. It's up to Al whether he wants one or not."

Dave immediately looked puzzled. Seconal was a sedative drug we carried on the flight. Why would Deke ask two of us to take it and not all of us? Without an explanation, Dave decided against it. We continued running experiments and stowing equipment. Meanwhile, at mission control the doctors grew alarmed. Watching their instruments, they could see something wrong with Jim's heartbeat. Both sides of his heart were contracting at the same moment. They'd spotted similar, minor blips with both Jim and Dave while they were on the moon. But this irregularity looked worse. Jim could be heading for cardiac arrest.

The doctors didn't tell us. Neither did Deke, who simply requested we take the sleeping pills. We only had one other clue that something might be wrong, when the ground told me, "We'd like to make sure tonight that Jim is on the EKG for the evening." They wanted to keep monitoring Jim's heart via his biomedical harness. Again, they never said why. By this time, we all felt dead tired and didn't ask questions.

Jim and Dave would have worked until they dropped, they were so dedicated to the mission.



“We’re still trying to get cleaned up in here and get suits put away, and all that sort of stuff,” I told the ground. “It’s awfully cramped quarters, and there’s an awful lot of stuff to move around.” The spacecraft seemed very different now that three of us were crammed in again. “I kind of liked it here by myself,” I added wistfully.

If Jim were having a heart attack, it was about as good a place as he could be—weightless, breathing pure oxygen, wired to a heart monitor. Still, the ground should have told Dave. As commander, he needed all available information about his crew. By the time we got to sleep, I’d been awake for more than twenty-one hours, and my crewmates for twenty-three. If we had known of Jim’s serious condition, we would have stopped much earlier. Instead, we slogged on for three and a half hours after Deke’s call before we finally finished our day. It was later determined that the physical stress of working on the moon, combined with the brutal training before launch, had left Jim’s and Dave’s hearts depleted of potassium.

We felt exhausted and slept deeply for nine solid hours. But it may have been too late for Jim. We can never know for sure, but it is possible Jim’s heart was permanently damaged that day, and the countdown to his premature death had already begun.

The next morning, we all felt much better. Still wary of Jim’s condition, the ground asked him to continue to wear biomedical sensors, instead of a planned switch with Dave. Without an explanation given, Dave overrode the request. He knew how uncomfortable the sensors could be after a number of days and gallantly took Jim’s place.

Because I had changed orbit to rendezvous with *Falcon*, we now passed over new regions of the moon. “Dave and I are looking like mad and taking pictures,” I told mission control as we glided across the ever-changing landscape. The laser was failing, so we cycled its power switch in a last futile effort to keep it working. I still struggled with booms refusing to retract. Equipment was starting to deteriorate. But with three of us in the spacecraft, we could run SIM bay experiments and take photos out of the window at the same time, so we stayed very busy. I wasn’t too upset about the failing equipment. We’d already gathered so much information, I was just happy with what we had.

With all three of us scrambling to accomplish tasks, my day seemed much more complicated. I felt very happy to have Dave and Jim back alive, but I began to miss working alone, when we didn’t all have overlapping tasks.

We still had a lot of film left, so we eagerly recorded many interesting geological features. While we did, the ground continued to ask cryptic questions about Jim. “Can you guys give us any estimates on the water that you and Jim consumed on the surface,” mission control asked, “and any differences between this and what Al’s been consuming?” Still unaware of the reason for the questions, Dave brushed them off with, “I think that is probably a good discussion for the debriefing after the flight.”

We were once again asked to take sedatives for the sleep period, and once again Dave responded, “I think that’s unnecessary.” The nearest to an explanation we received was, “We are anxious for you all to continue eating and drinking well, because of the EVA yet to come.” If they had told us the truth, we would have shared their anxiety and probably followed their requests.

Instead, oblivious, we continued with our science objectives, mapping and measuring the moon until mission control told us, “You’re ready for sleep and we’ll tuck you in.”

We were up the next morning raring to do more of the same. We zoomed in on the shadowy amphitheaters of crater rims and floors, prying out their secrets with our lenses. “As we go around in lunar orbit,” Dave told our geology team back on Earth, “I could just spend weeks and weeks looking. And I can pick out any number of superb sites down there.” Almost misty-eyed, he continued, “There is just so much here. To coin a phrase, it’s mind-boggling.” I couldn’t have put it better myself.

We were pleased to hear from Karl Henize that our flight was making front page news around the world. Perhaps the public was still interested in moon exploration after all. He also told us that, back in Houston, they'd been soaked with rain all day. "Going to be a lot of grass cutting to do when you get back down here, guys," he quipped.

"Oh, yeah, but we've sure got nice sunny weather up here," I replied with a chuckle. "It's just as clear as crystal." Besides, what did I have to worry about? I lived in an apartment. No lawn.

We began our final lunar orbits, operating the panoramic camera until the film ran out. No sense in wasting it, and who knows what it might pick up. Somewhere below us, a Soviet robot was driving around on the surface making discoveries of its own. Perhaps we would capture it on film and have a cool photo to present to the Russians.

"We've powered up the drugstore to receive the film when you get home," Joe Allen joked from mission control.

"Better get a couple," I quipped. We had a mile-long roll of film to develop.

It was time to raise our orbit a little, so the little satellite we were about to deploy could circle for a year before it was tugged down by gravity. A quick three-second burst from our engine raised our orbit by more than ten miles.

In our last hours around the moon, I received a heart-warming message. "I have a message for Al," Joe Allen radioed from Houston, "from the King."

"Go ahead, Joe," I replied, curious to hear what Farouk wanted to tell me.

"The message to you is to stand by to copy your final exam grade in orbital science and observation," Joe replied. "It's an alpha-plus, with a subnote of: *well done*."

"Tell the King thank you very much, Joe," I responded with a grin. "I expect to see him back in Houston soon." I was delighted that Farouk was so happy with my work.

It was time to launch our small subsatellite from the side of the service module. Launching an unmanned spacecraft from a manned spaceship around the moon had never been attempted before. I carefully aligned *Endeavour*, flipped a switch, and from its cradle inside the service module I could hear the satellite whipping along a curved groove in its spring-loaded release device like a bullet in a rifle barrel. By the time it spun off the end and into its own lunar orbit, the little tubular satellite was rotating fast enough to push out three whip-like arms which stabilized its wobbling spin. We watched it leave from our windows, its tiny solar panels glinting in the sunlight. Dave cried "Tally Ho!" to mission control, an old pilot's phrase for spotting another aircraft, adding "a very pretty satellite out there." Scientists on Earth would track the satellite for months to come, learning more about the moon's gravity field, Earth's magnetic field near the moon, and solar particles. The moon's gravity would eventually drag it down to make a new crater, our mission's final touch of the lunar surface.

I had enjoyed my six days in lunar orbit. It sounds like a hell of a long time, but there was so much to see and explore that I never grew bored. The sunlit part of the moon shifted as the days went by, so there were always new places to view. I could have happily spent a few more days there—the same feeling I get at the end of a great vacation. But it was time to go home.

I busily checked the temperatures and pressures of our main engine's propellant tanks. If there was ever a time that I felt particularly tense or nervous on the spaceflight, this was it. With no lunar module, we were down to one engine. If it failed, I'd be looking at the lunar surface for the rest of my life, which would be as long as our oxygen lasted. In addition, without *Falcon* attached to the nose, *Endeavour* was a much lighter machine. If our engine's control system did something wrong, I would have to react instantly, or we could be quickly rocketed in the wrong direction.

As Earth began to set on the lunar horizon and we prepared for our final pass over the lunar far

side, Joe Allen wished us luck with a final nod to James Cook's era of exploration. "Set your sails for home," he told us. "We're predicting good weather, a strong tailwind, and we'll be waiting on the dock."

"Thank you very much," Dave replied. "We'll see you around the corner." Mission control would not know the success of our engine firing for sure until we emerged from behind the moon.

Then we lost radio contact with Earth for the last time. I thought back to my television interview with Fred Rogers. A child had wanted to know if I'd be scared flying to the moon. It was important to be honest. Yes, I replied, risky work can be scary.

When the engine lit, it was a real kick in the pants. I could feel the steady acceleration as it burned for over two minutes. I warily watched the gauges that told me our engine was burning smoothly and steadily, speeding us on the correct curved pathway out of lunar orbit and back to Earth.

To my relief, the burn was beautifully smooth. Soon we rounded the far side again and, as we climbed away from the moon on our new course, Dave could announce "Hello, Houston. *Endeavour's* on the way home."

We shot away from the moon at more than fifty-seven hundred miles per hour, turning the spacecraft so we could look back and use up much of our remaining film on the rapidly receding moon. "We're almost speechless looking at the thing," Dave told mission control. "It's amazing—looks like we're going straight up," he added, commenting on our new burst of speed. "We're leaving, there's no doubt about that."

It was clear from my first glimpse out of the window that the moon was shrinking. And the dramatic sun angle highlighted new features for our parting glimpses. Parts of the lunar south pole and the immense crater Tycho were visible for the first time, and I took pictures with a mixture of fascination and sadness. I'd never get to see them up close again.

"That's a pretty good view after all those days of going around and around, isn't it?" Dick Gordon radioed from mission control.

"Yeah, *boy*," I replied, scanning the rugged terrain that bulged out in our direction. "We're looking at new territory." For the first time in a week, I could gaze at the entire sphere of the moon in one window. "You can see it all in one big gulp, and boy, what a gulp!" I continued to describe lava flows that we had not spotted before, until the details were too hard to make out anymore.

I fiddled with some SIM bay experiments, placed the spacecraft back into barbecue mode, then settled in for our three-day coast back to our home planet. Mission control signed off, reminding us that "our ever-watchful eye will be on you while you sleep." Before the day was out, Dave shared a pleasant thought with Houston. "We've got another unanimous vote up here. That was really a great trip."

It almost sounded like the mission was over. But as I went to sleep, I knew that tomorrow would be one of the most important days of my astronaut career. I would make the first-ever deep-space EVA.

When I woke the next morning, I first had to carry out some navigation. We had one shot to get back home, and I wanted to be on course from the beginning. While Houston kept an eye on us to make sure we didn't stray out of a general path of certainty, I hoped to prove that it was possible to navigate to and from the moon without their help. I was aiming for a narrow sliver of horizon on a planet tens of thousands of miles away, and there was no margin for error. This far from Earth, the tiniest changes in direction could result in huge errors once we had traveled the remaining distance in our voyage.

I used my sextant and measured the angle between Earth's horizon and my preselected stars. However, I also had to choose the right *place* on the horizon. Our planet is about eight thousand miles across, and the horizon is only fifty miles thick. That sounds tiny, and it looked tiny from so far away,

but fifty miles was too wide for what I needed to do. I needed more accuracy.

In my training I had calibrated my eye for a specific part of the atmosphere. Between Earth's surface and the blackness of space, the atmosphere looked like narrow bands of different colors, mostly subtle differences of reds, magentas, and blues. I had experimented in simulations on Earth to identify a thin color line I could find consistently. I looked for a particular light blue within the atmosphere when navigating, and this reduced the fifty-mile width to a much smaller path as we left the moon. It worked even better than it had in the simulators—we stayed firmly on track.

Mission control called again and jokingly congratulated me on the accurate navigation. "They're awarding the honorary 'Vasco da Gama Navigation Award' for excellence in this," Joe Allen teased, referencing the early Portuguese explorer who'd sailed from Portugal to India—and back again, which was more on my mind at that moment.

"Be advised," Joe added, "you are leaving the sphere of lunar influence and it's downhill from here on in." We were still much closer to the moon than the Earth, but because our planet is so much larger, its gravity pulled on us more. We were now truly falling to earth. It meant nothing to us in the spacecraft—there was no physical sensation of movement, no outside indication of our incredible speed as we shot through the empty black void.

There was a slight sense of disconnectedness on the long journey out and back between moon and Earth. At every other time in my life, even in Earth or moon orbit, there was a sense of the ground being below me. Here, both Earth and moon were remote, faraway places. I found it really stimulating. To see the sun, Earth, and moon in sequence as our spacecraft slowly spun made me think more about the moon rotating around Earth, which in turn rotated around the sun. I'd read about this in school and knew it intellectually. However, to be out in deep space and see it firsthand made me sense it on a deeper level. The human species seemed both more and less significant now: less, because I felt dwarfed in this vast blackness; more, because I was able to see it and explore it.

It was time for the three of us to float back into our spacesuits and help each other zip up. We placed guards over the control panel switches so I wouldn't kick them as I floated outside. I disabled some spacecraft thrusters: the last thing I needed was a thruster to fire as I floated by. We also stowed and tied down loose items in the cabin. After the work Dave and Jim had done to collect moon rocks and place them in sample containers, we didn't want our prizes to float out of the hatch. We worked slowly and carefully through our preparations for my spacewalk, and everything went very smoothly. I was glad because we were about to do something never tried before in the program.

"You have a *go* for depress," mission control told us. We slowly began to let the oxygen out of the cabin through a special valve in the hatch. Everything in the spacecraft looked the same, but I knew now that if I took off my helmet, I would die. The inside of *Endeavour* was soon as airless as the deep space we traveled through.

"We're getting ready to open the hatch," Dave reported. "Okay. Unlatch." I depressed the safety lock that meant the hatch couldn't be accidentally opened, always a wise precaution in space. I pumped the hatch handle to rotate the latches out of their locked position. Then, with a careful push, I swung the hatch open.

Apart from briefly floating inside *Falcon* days before, I hadn't left the confines of *Endeavour* for eleven days. I'd last slid through this hatch on the launchpad in Florida. Now I was about to float out of it more than 196,000 miles from home, into the deep space between Earth and moon. It was a thrilling thought.

"The hatch is open," I announced. The open, square hatchway now framed only deep blackness. I poked my head outside and carefully mounted a TV camera and a movie camera on the hatch so they

could capture my spacewalk. Then, grabbing the nearest handrail, I soundlessly floated outside into the void.

I paused a moment and waited for Jim to poke his head and shoulders out of the hatchway behind me. He would stay there and keep an eye on me while I made my way down the side of the spacecraft. Other than our service module glinting in the sunlight, it looked *really* black out there. I looked down the length of the SIM bay. “The mapping camera is all the way out,” I reported to mission control. It was one of the pieces of equipment that had begun to fail as the flight went on, and I had suspected it could no longer retract all the way back into its housing. Sure enough, it was sticking out. This could complicate my spacewalk a little as I would have to float over it without losing my grip on the handrails. “You ready, Jim?” I asked. “I’ll work my way down.”

After eleven days in space, I was accustomed to weightlessness. Working outside turned out to be a lot simpler than I thought. With one hand on a handrail, I could turn my body with my wrist. The SIM bay was slightly to the left of the hatch, so I first needed to swing across the face of *Endeavour*. I let my legs float up, and then I swung around and worked my way down the side of the spacecraft, hand over hand, never using my feet. It was even easier than in the water training tank.

I floated over the stuck mapping camera, then rotated myself on the handrail, placing my feet in special restraints. I took a quick look around while Jim floated into position.

I hadn’t really had a sense of where I was until this moment. Standing upright on the side of the spacecraft, attached only by my feet and the umbilical that loosely snaked back to the spacecraft hatch, I had a fleeting sense of being deep under the ocean, in the dark, next to an enormous white whale. The sun was at a low angle behind me, so every bump on the outside of the service module cast a deep shadow. I didn’t dare look toward the sun, knowing it would be blindingly bright. In the other direction, and all around me, there was—*nothing*. It’s a sensation impossible to experience unless you float tens of thousands of miles from the nearest planet. This wasn’t deep, dark water, or night sky, or any other wide open space that I could comprehend. The blackness defied understanding, because it stretched away from me for billions of miles.

But there wasn’t time to ponder it too much. I had work to do. I pulled the cover off the panoramic camera, released the film cassette and tethered myself to it. It came out even easier than I expected, although it felt a little bulkier than in simulations. Keeping one hand on its handle, I used my other hand to pull myself back toward the hatch. When I came to the stuck mapping camera again I had to let go of the handle for a second to maneuver over it. But it was only for an instant as I swung my legs out wide, then I had a firm grip once again.

Jim waited for me at the hatch. “Would you like to get hold of it?” I asked with a laugh as I passed him the film. Jim tethered it inside, released the tether attaching me to it, and I was free to float back down again. It was all going so simply. If I had known that Jim, now blocking the hatch, had heart problems, I may have felt much less secure. If he’d had a heart attack at that moment, we’d all have been in danger.

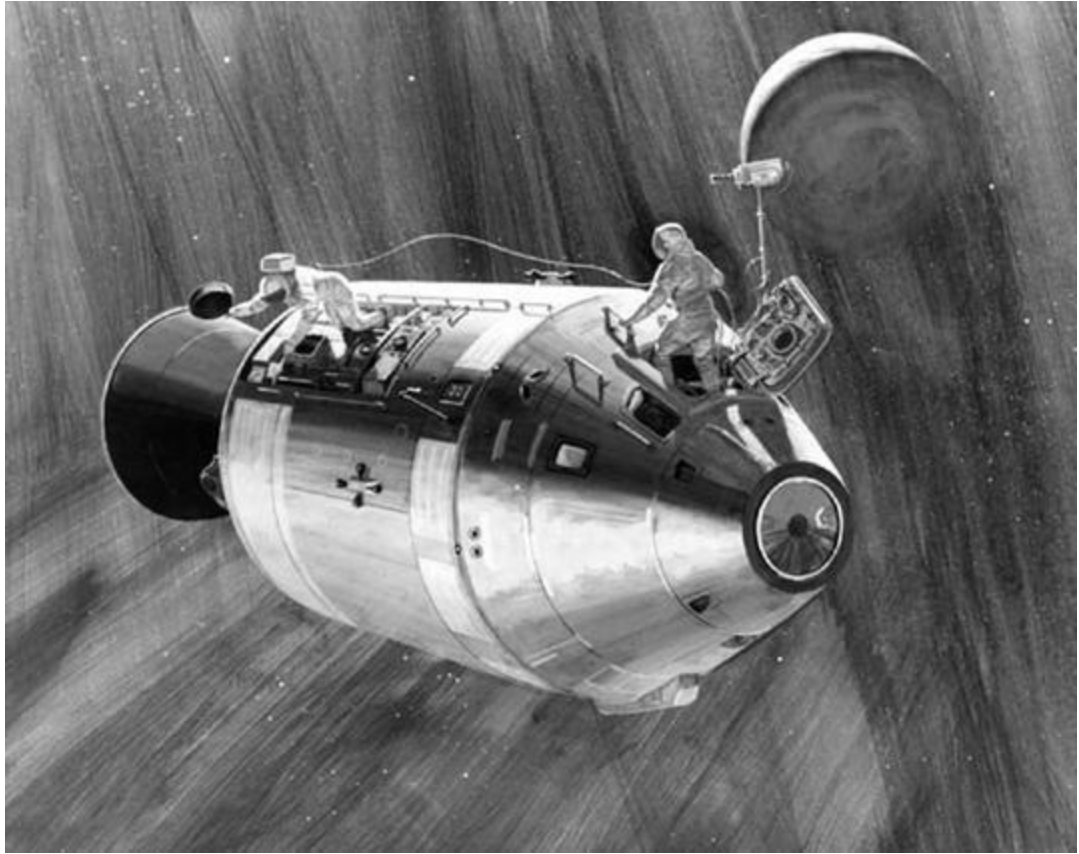
But Jim was okay. While Dave stowed the panoramic camera film deeper in the cabin, I floated back down the side of the spacecraft. “Beautiful job, Al baby!” Karl Henize radioed from Earth. “Remember, there is no hurry up there at all.”

“Roger, Karl,” I replied as I grabbed the handrail again. “I’m enjoying it!”

I floated back down the SIM bay, much faster this time. I’d been asked to look at one of the panoramic camera’s sensors. It hadn’t worked well during the mission, and the engineers on Earth wondered if there was perhaps a crack or contamination in the lens. I floated over it and peered in. “There’s nothing obscuring the field of view. The glass is not cracked,” I reported. “It’s perfectly

clear.” Engineers would later find that the problem with the sensor wasn’t with the lens after all, but the signal.

I also had a look at the mass spectrometer. We’d had trouble with its boom, and when I peered at it closely I could see it hadn’t completely retracted, a problem that seemed to happen only when the equipment was in shadow. It had been too cold to work correctly. I could explain exactly what the problem was, a luxury mission control rarely enjoyed with instrumentation on the outside of a spacecraft.



*A NASA artist's impression of my spacewalk with Jim watching from the hatch*

It was time to remove the mapping camera film cassette and bring that back inside, too. This time the cover didn’t cooperate, and I had to twist and pull hard three or four times before it came away. But after that, it was simple. I pulled the mapping camera film out and floated it back over to Jim, who grabbed it and unhooked the tether from me.

As we did this, I saw one of the most amazing sights of my life. “Jim, you look absolutely fantastic against that moon back there,” I exclaimed. “That is really a most unbelievable, remarkable thing!”

Jim was perfectly framed by the enormous moon right behind him. It looked as big as the spacecraft, and was dramatically lit by the sun, emphasizing the rugged craters. I could even see myself, floating in space, reflected in Jim’s visor. It could have been the most famous photo in the space program, if I’d been allowed to take a camera out of the spacecraft.

I’d argued for carrying one, but the mission planners had worried I’d be busy enough. Now, I really wished I’d had one. Not just for the photo of Jim. I could also have shown them what was wrong with the mass spectrometer instead of just describing it. And there was something else I spotted which would have been good to document: the thrusters on the side of the service module had bubbled and burned the module surface when they fired. We’d never been able to see this before, and it wasn’t

good. It hadn't damaged anything vital that I could see, but I guessed the engineers would want this problem fixed before the next mission.

Well, if I didn't have a camera, I could at least take a look at where I was. After all, twelve people would walk on the moon during Apollo, but only three would make a deep-space EVA. I would forever be the first, and to this day I hold the record for floating in space farther away from Earth than any other human.

I realized I had a unique viewpoint: I could see the entire moon if I looked in one direction. Turning my head, I could see the entire Earth. The view is impossible to see on Earth or on the moon. I had to be far enough away from both. In all of human history, no one had been able to see what I could just by turning my head. It was *incredible*.

My major tasks outside were done. It had been so simple, I was amazed. I'd practiced so much back on Earth that my spacewalk went by very fast, so fast, I couldn't believe it was already over. When mission control asked if I had any other general comments on the SIM bay before coming back in, I took the opportunity to make a third and final float down to the mapping camera to see if I could work out why it had jammed. I did a cartwheel motion on the handrail, examining the camera from many angles. With the sun angle so low, it wasn't easy to inspect. In the vacuum of space the shadows on the spacecraft were a deep, impenetrable black. The camera cast a dark shadow, and I couldn't see anything jamming it in place. It was time to float back inside.

I carefully pulled the hatch closed. It swung in smoothly and latched easily.

Right away, I wished I had spent more time out there just looking around. We had plenty of time. Those film canisters with their priceless images were now safely inside the spacecraft. But I could have soaked in the scene a little more, just for myself. I would also have liked to have floated all the way down to the base of the spacecraft to examine the engine bell. But I know mission control wouldn't have liked that.

If I couldn't take photos outside myself—and Jim had not taken any stills of me either—I knew that at least the fuzzy TV camera and the far sharper 16mm movie camera should have picked up some spectacular images. But I was wrong. The 16mm camera, we learned later, had jammed. It had captured only one frame showing me floating away.

I teased Dave and Jim about this when we got back to Earth. You guys have hundreds of photos walking on the moon, I joked, and I only have one shot of me doing my spacewalk. And is it of my head? No. It's a photo of my spacesuited ass. Thanks a lot!

When I returned to Earth, to make up for the lack of photos, *National Geographic* magazine commissioned the talented artist Pierre Mion to paint my view of Jim framed by the moon. After I described what I had seen to him, Pierre did a wonderful job capturing it, the next best thing to being there. The image was printed in the magazine. I recommend you search out a copy and look for the little image of me reflected in Jim's helmet visor.

We gradually brought the cabin pressure back up, until it was safe to remove our spacesuits. Jim's heart had held out just fine. And Dave was delighted with the EVA. "You've done good," he exclaimed with a laugh. "You've made a lot of people back there very happy!"

Karl Henize soon added more praise from Houston. "The guys down here would like to send up their warmest congratulations," he radioed. "You sure made it look easy up there."

I brought some of the SIM bay experiments back online, this time to point them at a mysterious X-ray source in a faraway binary star system. We continued to run other experiments, such as taking ultraviolet photos out of the window. We all felt more relaxed and happier—the key parts of our mission were now completed. I still needed to navigate our spacecraft, but other than that we simply

prepared to get back to Earth. We chatted about how, compared to earlier flights, lunar landing missions had much less room for error.

“This is sort of an all-or-nothing kind of operation, you know?” Dave remarked to me, when Houston wasn’t listening in. “It really is,” I agreed. “All your eggs in one basket, boy. I got to thinking about that after you guys left for your descent. Once you start that descent, man, that’s it ... It’s all hanging out from there on.”

With most of the danger now over, we could ponder the amazing events of the last few days. “I wish I would have tried running alongside the rover at the same pace,” Jim chimed in. “It would’ve been neat to do a few things like that.”

“Well, I’ll tell you, I’m sure glad we got rid of that clothesline operation,” I added, thinking again of the original plan to bring in the film cassettes during my spacewalk. I’d loved every minute of my EVA. “It’s really a ball when you get all suited up, get cooled off, and get the hatch open.”



*The television camera image of me floating in the deep blackness of space*

I thought some more about the moon. It had been an incredible place to visit and a wonderful mystery to try and unlock, but it was scarred and dead. And what can the living truly learn from the dead? Earth, growing a little larger in our windows, looked beautiful and full of life. It was time to sleep once again, with a smile on my face. I was going home.

When we awoke for the twelfth day of the mission, we still had more than one hundred and fifty thousand miles to go before we’d reach Earth. Even though we sped along at more than four thousand feet per second, we had another day and a half of travel ahead of us. We were truly a tiny sliver of metal crossing this huge, dark void.

Despite the distance, we never felt alone. Houston continued to send us new changes for the flight plan, along with updated instructions for our science experiments. They reported that the weather looked good for our splashdown zone; I wouldn’t have to redirect our course. Dave stayed relaxed and happy. “Yesterday, we finally got to catch our breath,” he told mission control. “The hours are



long, but the accommodations are palatial!”

Karl Henize radioed an unexpected update on one of the SIM bay experiments from its chief scientist. “On the gamma-ray experiment, Dr. Arnold reports that Al Worden probably performed the first recorded repair of a scientific instrument in space, because earlier in that day he’d begun to experience some problem with excess noise in the gamma-ray experiment. And when Al went out in the EVA—we don’t know what happened there—but at the end of the EVA, the gamma ray cleared up and has been doing beautifully ever since. You must have given it a pretty good kick there, Al.”

I didn’t recall accidentally kicking it, but I was glad to hear it worked again. “Not only is he a plumber, he’s an electrician as well!” Dave quipped.

Houston also reported with delight that a special mirrored device left on the lunar surface by Dave and Jim was bouncing laser beams back to Earth perfectly. The TV camera left at Hadley plain was less successful. It had been panning around the landing site when it suddenly stopped working. “Would you like us to go back up and check it for you?” Dave asked with a grin.

“Knew you were going to ask!” Joe Allen laughed in response.

Joe read us the morning news. “The government reports today the latest figures in the nation’s unemployment problem, and one private economist predicts the jobless rates probably will show still another rise.” I thought briefly about the Apollo program and the layoffs of all the amazing workers we’d collaborated with. There were only two more missions ready to go to the moon after ours. The moon landings would soon be over. A lot of people would lose their jobs, and many astronauts would sit around with nothing to fly.

I still wasn’t completely sure this would be my only spaceflight. I felt much more certain that it would be my only flight to the moon. Perhaps, in hindsight, I should have spent more time in those last days enjoying the view and weightlessness, as I would never have them again. But I really only thought about the things I needed to do to ensure we returned safely home.

“Al, the way people talk down here, they’re going to give you a medal,” Karl Henize radioed, impressed by my continuing navigational accuracy.

“Congratulations, Al, you’ve just been voted to receive a second Vasco da Gama award,” Bob Parker on our support crew added. Thanks, guys, I thought to myself. That meant a lot to hear.

We had time to give a press conference in space, answering questions submitted by reporters. I enjoyed the conversation because it made us feel even closer to home. I was asked about the highlights of the flight so far. One, I said, was the engine burn into lunar orbit, when I saw the moon up close for the first time. The other was the successful burn out of lunar orbit, meaning we’d come home. That about summed it up—amazing exploration and staying alive.

After some other discussion about Apollo 15 “already being described as one of the great events in the history of science”—that was nice—they asked me about my spacewalk the day before.

“As far as what I felt like when I went out there,” I explained, “it was sort of like walking on stage at your high school dinner dance or something. We opened the hatch and it was pitch black, and as soon as we got out, the sun was beating down on everything, and it looked like a very large floodlight on a stage. And then putting the TV camera out on the door just added a little bit more to that sort of unreal feeling that it was time to get out on the stage and do something.”

“If you could see the size of the film magazines that Al brought in yesterday from those cameras,” Dave added, “you’d see that we have indeed at least a great deal of data on film alone.”

“Hopefully, we’ve added to our store of information about the moon and about ourselves,” I concluded, “greater than the capital that was spent on the flight itself.”

Before we turned the camera off, I flashed a quick victory sign at the viewers, as I had done on the

way to the launchpad. We would be successful on the flight, much like going into combat, and we were sure of winning. Now we had succeeded in our mission, I made the gesture for a second reason—as a peace symbol. When looking at Earth as a whole planet, that seemed appropriate.

We spent much of the day stowing all the items in *Endeavour*'s cabin. The spacecraft's center of gravity could not be off balance during our carefully planned plunge back through Earth's atmosphere the next day. We handled the moon rock sample containers with particular care, until the space beneath our couches was jammed with carefully arranged white bags. It was time to settle in for my last sleep in space.



## CHAPTER 11 CELEBRATION

I was jolted awake by a Hawaiian war chant piped over the radio by mission control. Back in Houston, the flight surgeons saw my heart rate shoot up as the music blasted me into alertness. “That got everybody up!” Dave retorted. But the tune was appropriate, as only a few hours remained until we planned to splash down in the Pacific Ocean, a couple of hundred miles north of the Hawaiian Islands.

“We just got our first view of the Earth this morning,” Dave reported, “and can you believe it’s getting larger *and* it’s getting smaller? We see just a very, very thin sliver of a very large round ball.”

Earth didn’t seem to grow much in our window until that day. Like any massive but distant object, it doesn’t grow much as you draw close until the last few moments, when it looms up at you. In these last hours, the crescent Earth grew fast against the backdrop of space. It was clear we would hit it, and my calculations showed we would strike our target at the right place and the right angle.

I shut off the SIM bay experiments for the last time, retracted the booms, and powered down the experiments one by one. They had done an outstanding job, and in a few hours’ time they would become shooting stars streaking through Earth’s atmosphere and burning up, abandoned. But the data they had returned would keep scientists busy for years.

Houston, cryptically, asked both Dave and Jim to keep their heart rate monitors on all the way through reentry. They were not concerned about mine. Dave complied, still unaware of the reason.

We made one last minor change in our course—a burn of a few seconds with our little thrusters—and I headed back to the optics to check star alignments and confirm we were perfectly on course. We could have come back fine without firing the thrusters, but the small maneuver placed us in the middle of our reentry corridor. All looked good.

“I thought we’d let you know, from our preliminary tracking, you’re sitting right in the center of the corridor now,” mission control confirmed.

“Great! That’s a nice place to be!” Dave replied.

We grew busier inside the spacecraft, checking all the systems. Batteries would feed power to explosive devices that hurled out our parachutes, and they needed to work in a precise and accurate sequence for us to survive. I tested *Endeavour*’s reentry thrusters. They eventually responded with a reassuring snapping sound, and I could see the flashes of flame outside the windows as I pulsed them.

It was time to separate from the enormous service module which, in addition to the SIM bay, had carried our main rocket engine and all of the consumables we needed for the trip. I flipped a switch, and in a carefully orchestrated and speedy sequence, pyrotechnic devices neatly severed the water, oxygen, and electrical connections between the two modules. Then I heard a *thunk* as the service module separated and drifted away from us. “We got a good sep,” I reported to mission control.

I turned the lights down in the spacecraft a little and looked out of the windows. I hoped to use Earth's horizon to orient myself. By now we were racing toward the shadowed side of the globe, a black sphere against a black sky. And yet if I looked carefully, I could see the milky, faintly glowing horizon looming in my window.

The explosive separation from the service module had jolted some little items loose from hiding places in the cabin, and some of them now floated by our faces. "Here, my friend, is a lunar rock," Dave noted, spotting a moon nugget that must have lurked somewhere in the spacecraft for days.

All that remained now of the enormous rocket launched from Florida was our little *Endeavour* command module, its heat shield exposed for the first time during the mission and pointed firmly in our direction of flight. We plunged down into the darkness at more than thirty thousand feet per second and waited for the first sign that we had reached the outer fringes of Earth's atmosphere.

"Look out the window, and you see ionization," Jim remarked. The heat shield behind our backs was hitting the first wisps of air. Faint yellow-orange glowing tendrils appeared outside the windows as we pushed through the atmosphere and lit the air into hot plasma.

We broke into daylight. "Oh, that's the Earth down there, baby!" I cried, as I peered through the glow and began to see familiar features. I could clearly see Alaska, down to Japan and beyond, a huge sweep of the Northern Hemisphere.

"Can you see it?" Jim asked us, straining for a view from his couch.

"Sure as hell can," Dave confirmed. "It's big and real!"

I had angled the spacecraft precisely so that our heat shield dug into the atmosphere. I began to feel a very gradual deceleration, a little like putting on the brakes when driving. I watched the earth zip by below us unbelievably fast. "Oh, man, are we moving, too!" I cried. "Son of a gun! Shee-hoo!"

*Endeavour* was designed with an offset center of gravity, so it had a little bit of lift. Not much, but enough to maneuver. By digging into the atmosphere, we made sure we didn't skip back out into space again. The glow outside our windows increased, as did the feeling of deceleration. Looking up, I could see a long glowing trail behind us, like a lit neon tube, with flashes of pink, green, red, and yellow. We were slowing dramatically after our plunge through space, but still raced across the face of the planet.

"Sure are a lot of mountains down there," I exclaimed, fascinated. "How about that!"

"I think that's Alaska out there," Jim added, staring at upside-down peaks. "That would be right, wouldn't it?"

The ionization built up until we lost the ability to transmit radio signals to Houston. Not that they could help us now. The G-forces increased, and the fiery orange glow outside the spacecraft brightened. I could see the trails of glowing gases swirl as they changed path around our blunt spacecraft and twisted away behind us in corkscrewing patterns.

After almost two weeks of floating freely, the deceleration built until I weighed six times as much as on Earth. Lying in the couch, however, meant the force was on my chest so I didn't really notice it. Besides, I was too excited. But Jim wasn't doing so well and felt like he was unable to move and close to blacking out. There was nothing he could do but endure.

Once there was no danger we'd skip out of the atmosphere, I followed a precise course to take us to our targeted splashdown site. Closely monitoring my instruments, I pulsed our thrusters to roll the spacecraft, using the heat shield as a kind of wing to change our lift. The pressure on our chests eased a little. Leveling off our path, we eased our downward plunge and slid through the atmosphere as I maneuvered left and right.

Mission control could hear us on the radio again. "Everybody's in fine shape," Dave reported with

relief.

“Good to hear you again!” Bob Parker replied.

We slowed to ten thousand feet per second. “One hundred miles to go,” I reported, as condensation rained down from the docking tunnel above us and soaked Dave in the center couch. Soon I was not able to maintain any more horizontal movement; gravity pulled our slowing spacecraft down. We dropped like a rock.

Around twenty-four thousand feet above the ocean, the heat shield cover at the top of the spacecraft whipped away and two small drogue parachutes fired out to reduce our speed. “Good drogue,” I reported, feeling the tug on *Endeavour* as I saw the reassuring shapes open above us through my window. As we fell into thicker atmosphere, the pressure outside grew, and fresh air began to squirt into the cabin through a special valve.

Once the drogue chutes had done their job, they were released at around ten thousand feet. Three more small parachutes then popped open and pulled out our large red-and-white main parachutes. “And the mains are out—three,” I reported. “The mains are opening.” I felt the spacecraft slow and sway as the chutes smoothly opened.

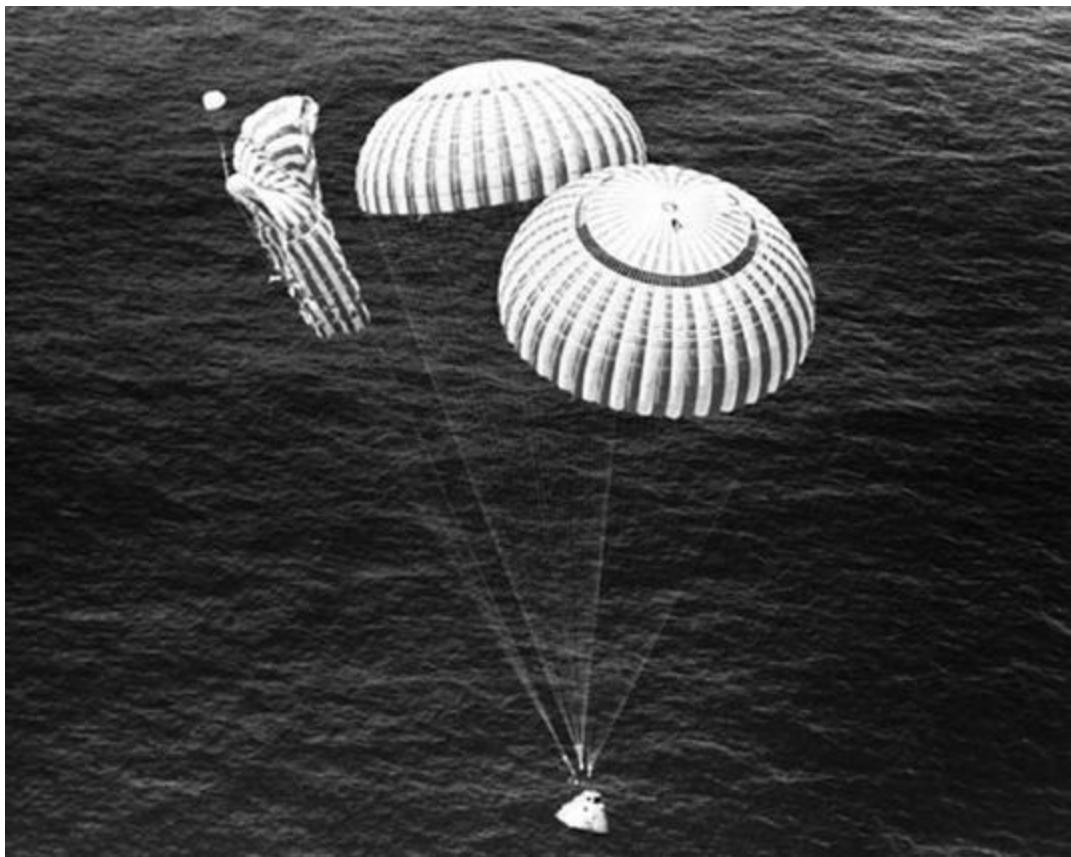
“CM propellant to dump,” Jim added. The fuel lines of our now-useless thrusters were still full of dangerous chemicals, and flight planners believed it was safer to vent them before we hit the water. The chemicals would burn as soon as they touched each other, and if we ruptured a fuel line on splashdown, we could have a nasty fire or explosion. Venting had worked fine on every prior mission. A large rising red cloud of gas obscured my view of the parachutes as we dumped the propellants overboard.

Helicopters from the USS *Okinawa*, the assault ship sent to recover us, had us in sight and circled as we fell closer to the ocean. “It appears that one of your main chutes is streaming,” one pilot reported on the radio, alarmed. “I can only see two main chutes, and one appears to be streaming.”

Oh, shit. “Do we have three, Al?” Jim asked me with concern.

“We got two!” I told him. The red cloud had cleared, and I thought I could see widening holes in one of our parachutes, collapsing it into a useless strip of cloth. “We’ve got a streamer on one.”

I can only guess what happened. There was very little wind that day, and when we vented the propellant, the corrosive, toxic cloud rose right up into the chute and ate away the material and shroud lines. We prepared ourselves for a hard landing.



*The disturbing sight of our parachute failing as we neared splashdown*

We could still land on two chutes; the third was more of a safety margin—a margin we had just lost. As I continued to look at the chutes, to my horror I thought I could see holes developing in a second chute, too. If it failed, we’d be in trouble.

Pilots on the circling helicopters grew excited. “You have a streamed chute. Stand by for a hard impact,” they told us. We already knew. There was nothing they could do to help us now, and we needed to concentrate. I wished they would stop chattering; I needed to focus.

*Wham!* We hit the ocean hard, gouging deep into water that splashed high over the cabin windows before we bobbed back up to the surface. Dave opened another air vent to the outside and got a face full of sea water, soaking him again. I quickly powered down the spacecraft. The second chute had held out long enough. We were back. We’d made it.

Those circling helicopters were quick. It seemed we’d no sooner splashed down than they had deployed Navy SEAL divers into the water. The SEALs busily attached an inflatable collar around the spacecraft as well as a raft for us to climb into. I saw a diver’s face at the window; he then knocked on the hatch. I wasn’t sure why—was he being polite and wanted us to say “Come in” first?

Soon he had the hatch open and threw in some life preservers which we put on. We gave him a quick thumbs-up to tell him we were okay. The ocean was calm, and a warm breeze came in through the hatchway. After a final check of the cabin, it was time to leave.

Dave and Jim climbed out. I was the last to exit and I took a final look around my home for the last two weeks. Now back on earth, it seemed impossibly tiny. What an amazing adventure I’d had in this little cabin. I’d been focused all day on getting us back to earth. Now that I was here, and safe, I wished I were back in space again, flying solo in the quiet and solitude.

Time to go. Feeling a little shaky, I climbed out of the hatch and into the waiting life raft. It felt warm and sunny out there, and the blue ocean looked beautiful. Our once-immaculate *Endeavour* was

now a charred orange-brown color, with almost all of the reflective insulation burned away, stained darkly around the thruster jets. It would never fly again.

A helicopter hovered over us, and one by one winched us up. I left with some concern, as the diving team could not get *Endeavour's* hatch completely closed. I thought of the priceless moon samples in there and hoped a rogue wave would not get them wet—or worse, sink the spacecraft.

“Astronaut Alfred Worden is in the aircraft,” the helicopter team announced. Since I was the last one to be winched up, this announcement was the signal for the flight controllers back in Houston to pass around little American flags and cigars. They wouldn’t begin to celebrate yet, however, not until we had safely landed on the deck of the *Okinawa*.

As the ship came into view, we scrambled to put on fresh blue flight suits, clean sneakers, and baseball hats. In our agreed explorer style, we had stayed unshaven. For dark-haired guys like Dave and Jim, that was obvious. For a light-haired guy like me, my stubble wasn’t easy to see.

We were freshly dressed by the time our helicopter landed on the deck of the ship. But I felt concerned about my legs. I had been weightless for two weeks, and now I’d have to walk across the deck in front of hundreds of cheering sailors, important dignitaries, and the world’s media. I hoped I wouldn’t fall flat on my ass.



*The Apollo 15 mission ends as I climb out of our charred spacecraft.*

I had to consciously tell myself how to walk. My legs didn’t work the way they should; I had lost the automatic sense of how to step. I had taken it for granted all my life, but after two weeks I’d forgotten. Jim looked a little shaky, too. I had to concentrate hard—left leg, right leg—as we strode down the red carpet toward the welcoming committee.

General Lucius Clay, commander in chief of Pacific air forces, was one of the dignitaries waiting to welcome us.

“It’s certainly been a wonderful and historic mission,” he said with a smile, “and I can’t help but also compliment you on your superb selection of music. Thank you, Colonel Scott.”

I suppressed a grin. A few days ago, around the moon, Dave had chewed me out for playing the air

force anthem during his liftoff. Now he had to accept the congratulations of air force dignitaries for playing it.

It was my turn to speak. I forced my legs into motion and shuffled up to the microphone. “It’s not that I’m shaky, it’s just that I don’t have my sea legs yet,” I began. “We just finished probably the most fantastic twelve days I’ve ever had in my life. And I guess only one thing surpasses the excitement and the intense feeling I had on the flight, and that was sort of the feeling I had when I saw you all today. It sure is nice to be back, and it sure is good to see you all. Thanks a bunch for the pickup!”



*Unshaven, I thank the welcoming crowd on the deck of the ship.*

The doctors were eager to get their hands on us and led us away for postflight tests. Even when lying down on a platform, we could feel that our heart rates were higher than normal. Our bodies were readjusting to gravity. The flight surgeons walked us around and took good care of us. We appreciated it, as we felt pretty odd. But we were still told nothing about the in-flight heart concerns.

For the first time, I noticed that Dave’s fingernails were black. He’d tightened up his spacesuit gloves so he could have a better feel at the end of his fingers when working on the lunar surface. As a result, he’d bruised and blackened them badly. He must have been in pain all the way back from the moon, but I had never known. Man, that guy was a hard driver. He was so goal oriented during the mission and would not give up, no matter what the barriers were. I had to admire that about him.

At last, after the medical checks, we could have a shower—our first in two weeks. Dave and Jim were still grimy with moon dust, and I didn’t smell too good either. Showers aboard ship were small and boxy, with rough military soap and towels. It was nothing luxurious. But after two weeks that warm water felt like one of the best showers of my life.

Time for lunch in the captain’s wardroom. The food on the flight had been good enough, but I was ready for something more substantial. A big, juicy steak awaited me, which I wolfed down. Dave and I had talked about ice cream all the way back from the moon, and now was our chance to be decadent. Jim didn’t eat much, but Dave and I slurped down ice cream like we were little kids.



I was full, and still not used to walking. But the celebrations weren't over. The ship had about seven different compartments, each with its own set of workers, and each wanted to welcome us. So we toured them all. Every compartment had baked a special cake. I felt pretty drained by then from the exertion, but I cheered up when I saw the friendly reception. I had a ball, probably on a sugar high from seven slices of cake.

We received the good news that *Endeavour* had been brought aboard the ship without any water slopping through the hatch. It had been a long and eventful day. I had woken up more than sixty thousand miles from planet Earth and ended my day on a ship journeying south toward Honolulu. It was time to get some sleep.

I woke up to the sound of clanging. Our berth was right below the flight deck, and those guys started work early. A military ship is never a quiet place. I felt much better, though, and very well rested. Jim, however, still looked tired. He hadn't slept well, he explained, because of the noise and also because he still felt odd, like his head was pointing toward the floor, even when he was sleeping flat.

We headed up to the deck, and there was the beautiful Hawaiian island of Oahu. A helicopter waited to take us the short journey to Hickam Air Force Base. Touching down, I stepped off the helicopter and onto solid ground for the first time since I had made my way to the launchpad in Florida. It felt good to truly be back on earth once again.

A crowd of thousands awaited us, along with some local dignitaries, so we gave some more brief speeches and thanked them. But there was no time in the schedule to enjoy Hawaii. After some hurried farewells, we were stuffed into a C-141 cargo plane for the long flight back to Houston.

By this point in the mission, I had forgotten all about the space covers deal Dave had arranged. Until we were back on earth, I'd had no reason to think about them for months.

But now here they were, as Dave pulled them out in the C-141. He'd not only had them stamped and postmarked to note the day of launch, he'd also managed to get them postmarked on the ship the day we splashed down. I looked at them with interest. I'd never seen one before. I'd never even seen the design.

While aboard ship, Dave had mentioned that he would have his covers stamped on the *Okinawa* with the splashdown date. Good idea, I thought. We hadn't gone back into *Endeavour* after splashdown, but a team of technicians had removed all the important items ready to transport to Houston. They returned our PPKs to us, which was standard procedure. So I had my covers postmarked. Mine were not postmarked on launch day because they had been stowed in my PPK inside the spacecraft, as per regulations.

Then there was another surprise for Jim and me. We'd agreed with Dave to carry a hundred covers for Eiermann. But Dave unexpectedly pulled out a pile of about four hundred.

Don't worry, Dave explained. He'd had another hundred made for each of us. We should keep them for ourselves until we were all out of the space program, and until Eiermann and Sieger had concluded their business. Otherwise we'd be undercutting them.

Dave was well prepared; he pulled out special pens for us to sign all of the covers. It was a smooth flight, and a long one, so we had plenty of time to sit there and sign away. I thought nothing of it. Once we landed I took my hundred covers with me to put in my safety deposit box. Jim took his, and Dave kept about two hundred, his own and the covers to send to Eiermann. It was done. I forgot all about them once again. In retrospect, I should have opened the door and thrown them out of the plane.

Perhaps it was an ominous sign of things to come with those covers, but it was dark and rainy when

we touched down at Ellington Field. Despite the weather a crowd of thousands had turned out, dressed in raincoats and carrying umbrellas. It was time to give another quick speech. “I’m on the last leg of a trip from Cape Kennedy to Houston,” I joked, “and I saw some interesting things along the way!”

“We went as Americans,” I summed up, “but we really did it for all mankind.” These weren’t just PR words—I really *meant* them. It was also my opportunity to begin to thank the tens of thousands of people in Houston and around the world who had helped us with our flight. We got the glory, but we couldn’t have done it without an enormous team. I was—and I remain—very grateful to them.

Deke Slayton also welcomed us and added his congratulations for a great job. To know I had pleased him meant more than all the other praise showered on us. He was usually sparing with congratulations, which was a good thing. When he gave it, you knew he meant it.

At last I spotted Merrill and Alison, my beloved daughters, who ran over to give me an enormous hug. They had been caught up in the excitement of Dad flying to the moon and were thrilled to see me again. I had missed them a lot—and *boy*, did I have some stories to tell them.

My parents were still in town. My father, so teary-eyed and emotional when I launched, was back to his normal self. “You’re back safe,” he whispered to me, “and I’m glad.”

Have you ever been away on a long vacation? You’ll know the feeling when you first put the key in the door of your home and then close it behind you. After such an eventful time, the apartment seemed so *quiet*. Everything was where I had left it. I had mail to sort through, chores to do. It was time to get back to normal life.

I had a strange experience the morning after I came home. When I walked out of my apartment door in the early morning to grab my newspaper, I saw the moon in the sky. It shocked me to see it. It was bizarre to think that I was there just a few days before, flying across its peaks and valleys. The moon looked so different now: so very far away. It really gave me a new perspective on how far we had traveled.

I’d been asked to skip breakfast that morning, as I headed back to my workplace for some more medical tests. Then we began many, many days of debriefings. The mission planners wanted to go over every detail of our flight plan while it was still fresh in our minds. So we sat around a table and talked through every moment of the mission, reliving it for the engineers. We spent about as long debriefing as we had flying the mission. It also took us that long for our bodies to get back to normal.

For several days I had to really watch how I walked and how I reached for something. It felt harder learning to adjust to Earth than it was to adjust to space, something mentally to do with coming home. In space, I was very aware of learning new ways of moving. Returning to Earth, everything felt familiar, so I relaxed and didn’t think about it. I would subconsciously push on a table to float away or try and leave an object hanging in midair. I had to teach myself how to live in Earth’s gravity again.

Of the three of us, Jim was in the worst shape. He was still unsteady on his feet and felt off balance when he lay down to sleep. I’d always thought of him as the weight-lifting, exercise-conscious guy, so I was surprised to see him so worn out.

Then, in the debriefing period, I was finally told what had happened to him during the flight. I felt confused, more than anything else. Why hadn’t they told us during the mission? There were ways we could have talked about private medical matters with the ground without the whole world listening in. I never got a good answer.

Dave was also having trouble sleeping because of an ache in his shoulder, something which our flight surgeons dismissed. But Dee O’Hara arranged for some private treatment and he improved. I had trouble sleeping for a different reason. I couldn’t get all the damn people out of my apartment.

Unlike the crews of earlier moon missions, we did not enter any medical quarantine, because the doctors had decided there was no risk of any possible moon germs returning with us. I would almost have welcomed the quarantine, because we could have debriefed without any distractions.

As it was, I would go to work, debrief all day, and there was always something going on when I got home at night. Many of the people in my apartment complex would drop by for a drink and a talk. They just wanted to be around somebody who had returned from the moon. I've always been a social guy and enjoyed their company, but eventually I had to kick them out every evening.

Then I would sit in my living room, turn all the lights out, and still not feel sleepy. I was overtired. I would finally get around five hours' sleep, drag myself out of bed, and shuffle back to the debriefings day after day.

With three worn-out astronauts, the debriefings soon became dull. At first, I felt proud to talk about what we'd done. Under Dave's excellent command, we'd really done our jobs, and felt delighted with the way things had turned out. The mission had been what Apollo was truly all about.

But after a few days of constant talking, I grew wearier. The room was windowless and the sessions were long. Ironically, the mission was tough to discuss since it had gone according to plan—there was little new to say. Much of the debriefing was record keeping, so planners could match the scientific data and photos with specific locations and times in the flight plan. Each mission controller asked endless questions about his own area of responsibility.

I only really enjoyed my conversations with Farouk, who was like a kid in a candy store when I shared what I had learned. But even he was being pulled in two directions: he had to brief the crew of the next mission, Apollo 16. I told him everything I could to help prepare them.

I would also have loved to talk more with the scientists responsible for all the SIM bay experiments. But first they needed to work on the raw data before finding time to talk to me. They also needed to concentrate on Apollo 16.

Even though I talked about the flight every day at work, the mission began to take on an air of unreality. It was as if I had gone to my father's theater as a child and become totally immersed in a movie, forgetting there was another world out there. Now the movie was over, and I was out on the street as cars and people went by, back in the real world again. The moon flight was an episode in my life that felt totally out of context; I didn't know how to place it in my mind.

I would sit in my living room at night, wide awake. It was quiet and peaceful, but my brain still went a mile a minute. So I grabbed some old coffee-stained legal pads and began to write down my vivid impressions of our flight. Unlike the technical debriefing, I relived the flight in emotions and remembered images. The words flowed freely and easily, and after letting them sit to one side for a while, I realized I had written something that might best be described as poetry.

I didn't do anything with those papers for years. But when I mentioned them to some friends in a Houston poetry group, they grew excited about the first poems written by someone who had traveled to the moon. They said I should publish them. I left the poems in a drawer for a few more years, but eventually I did publish them, in a volume called *Hello Earth: Greetings from Endeavour*.

The poems are about as good as you might expect from a pilot. I hope I did a better job than a poet would if asked to fly a jet with no training. And on those long nights when I couldn't sleep, the writing helped me. It was my own personal, emotional debriefing.

I went to the office every day and life seemed to return to normal. The debriefings only lasted a few weeks. Then it was time for NASA to send us on our next mission. This assignment would last for the rest of the year, and this time it was all about public relations. NASA needed to keep the tax dollars flowing. Sending us around the country, then around the world, allowed them to celebrate and

show off their successes.

Our first stop, in early September, was Washington, D.C. Vice President Agnew decorated each of us with the NASA Distinguished Service Medal, the highest award that NASA could bestow upon us. He was extremely friendly and made us feel very special. The next day, we headed to the Capitol building. From the podium where so many historic speeches had been given, we addressed a joint meeting of Congress, an unusual honor for an Apollo crew, given only to Apollo 8 and Apollo 11 before us. This experience certainly felt a little different from office work.

We were escorted into the chamber by a group of politicians including Congressman Chuck Chamberlain, who had helped me attend West Point all those years before, and Congressman Gerald Ford, also from Michigan. I'd cross paths with Ford again before too long, under very different circumstances.

Carl Albert, the Speaker of the House, introduced us in some of the most glowing words I could recall. "It is our great honor today to welcome to this chamber the recently returned heroes of Apollo 15's epic journey into space," he began. "I feel privileged to introduce to you three Americans who are such a credit to their country and who represent the highest qualities of human aspiration and courage."

Oh shit, I thought to myself, how the hell do I give a speech to match that introduction?

I had a little time to think about it while Dave made his remarks. They were excellent, inspiring, and a tough act to follow. But then Dave mentioned "my trusted colleague, Colonel Al Worden." It was my turn.

"First off, let me say I am overwhelmed by the reception. It is fantastic. I am proud to be an American. I am proud to be part of the Apollo 15 flight."

So far, so good. Time for me to share a message of what I experienced in space, beginning with our launch.

"Our view out of the window was of an area surrounding Cape Kennedy and some of the ocean. After the launch the first thing we noticed, particularly when we got into Earth orbit, was that we had a further view—we were further away from the Earth, and our view was expanding. We did not see any area around Cape Kennedy. What we saw were continents and oceans, a great deal of the horizon. After we left Earth orbit, and for the remainder of our flight, our view was one of the Earth. Our horizons were not limited to the area around us during the flight. We saw the Earth as a single planet. There is a oneness about the Earth that we do not see from the ground. We do not see any boundaries from that particular vantage point. We do not see any differences in race, or religion, or political beliefs.

"The thought struck me that there was an analogy between the Earth and between *Endeavour*. We were a team of three living in a spacecraft called *Endeavour*. We are all billions of people living on spacecraft Earth. We had to work as a team to survive and to maintain our own household during the flight. We *must* work as a team to maintain our household and to maintain our home called Earth.

"One thing is quite evident—particularly during the flight—our destinies were bound together by what we did in the flight. We relied on each other; we worked with each other. The same thing must be true on Earth. We must work together. We must rely on each other. We must work together as a team for Earth.

"We had the very crude beginnings of some tools to help us accomplish this goal on our flight. We carried many scientific instruments—a very crude beginning, admittedly—to do the kinds of work that have to be done to clean up spacecraft Earth. We carried scientific instruments that measured remotely. We carried some cameras that took pictures for analysis. As I said, this is a very crude

beginning, but it leads into the kinds of things that can be done in a small way to help clean up our spacecraft Earth.

“We cannot all go to the moon. The three of us were very fortunate to have gone. We sincerely hope that we can be your eyes and ears in providing the perspective of Earth that we had. Thank you.”

Jim added his remarks, and then the chamber rose and gave us a thunderous standing ovation. I felt I had given a good speech, not only a perspective on what my government needed to do, but also using the close teamwork of my crew as an example. That day, I couldn’t have felt closer to Dave and Jim while we shared in this extraordinary outpouring of praise.

President Nixon had called us while we were on the *Okinawa* and invited us to dinner at the White House. We were happy to accept. It was standard practice for invitees to bring their wives to dinner, too. Dave arrived with his wife, Lurton, and Jim brought Mary. I was single. It would have been fun to invite a date. After all, “Want to join me for dinner with the president?” was an unbeatable pickup line. But I doubt my NASA bosses would have liked that.

We all brought along our children, and the kids were taken upstairs for dinner. Before the evening was over, the president gave them a special tour. He was a great historian, steeped in the history of the White House. He took a real delight in taking the kids up to what looked like blank walls, and pointing out a near-invisible line in the paint. Then he’d push on the wall, and a secret bathroom would be revealed. Nixon laughed with pleasure as he entertained the children. He was just wonderful to them.



*As I stand between Dave and Jim, my speech receives a standing ovation from Congress.*

Before we sat down to dinner, we stood with the president on the balcony that overlooked the South Lawn. As we looked at the city lights, Nixon told his butler to fetch his hundred-year-old scotch. The butler quietly reminded him that there was only a tiny amount left. The president didn’t care—it was an appropriate occasion to finish it, he declared. So we gazed at the skyline and raised

our glasses in a toast.

It is strange to think now, but all five of the men who sat down to dinner that night—the president, the vice president, and the Apollo 15 crew—were marked for a dramatic fall from grace. At the time, all of us were riding high: Nixon and Agnew were on course to win a second term by a landslide the next year, and we were being honored by them with this special dinner.

If only we could have foreseen the catastrophes just around the corner for us all. Vice President Agnew was forced to resign because of criminal charges in 1973. Facing even weightier accusations, Nixon would resign the year after, the only American president ever to do so. The fate of our crew would be decided even sooner.

Although the seeds were irreversibly sown, this was still in our future. As an added honor, the president treated us to a weekend at his private mountain retreat, Camp David. After the grueling years of training, I enjoyed spending family time with Merrill and Alison, while watching Dave and Jim relax with their wives and kids. Mary and Lurton had seen precious little of their husbands in those busy and tense years, and now they could finally enjoy their company in beautiful and luxurious surroundings. I felt a momentary tinge of regret. I was at the pinnacle of my career, but my time around these happy families only reminded me of what I had sacrificed to get this far.

However, it was a time to enjoy, not to reflect. We visited New York for a motorcade through Manhattan with the mayor. We sat in an open-topped car and waved at the crowds, then met with the secretary-general of the United Nations. He presented each of us with the UN Peace Medal.

NASA never trained me in public speaking, but during our postflight itinerary, I grew to enjoy it. I didn't have any particular axe to grind and just said what was on my mind, which is probably why I wasn't bothered by giving speeches. I never used a script; I just tried to watch my audience and see what they responded to, changing pace if needed.

While in New York, we did a round of talk shows. The host of the *Today Show* back then was Hugh Downs, and he had a very funny sideman, the former baseball player Joe Garagiola. During our interview, Joe leaned in and said he understood that astronauts sometimes had differences of opinion in flight, but who had the last word?

Staying lighthearted in keeping with the show's tone, I raised my hand. Dave shot me a funny look, but Joe laughed and asked me for my answer. I told Joe that the last word was always me saying "Yes, sir!" to Dave. It got a big laugh, and the show continued.

But Dave didn't forget. In the relative privacy of a limousine on the way to our next engagement, he chewed me out for the entire ride. It wasn't the only time during that long world tour that Dave and I clashed. He didn't like me to say things that he hadn't come up with or vetted. The mission was over, but he was still in charge, and he would make damn sure I remembered it. Jim, miserable, slunk back into his seat during these exchanges and didn't say a word.



*Chicago gives us a wonderful welcome as we parade through the streets.*

What could I do? Dave could make life hell for me back in Houston if he wanted. As my commander, people would listen to his opinions about me. So I gritted my teeth and, without letting it suck all the enjoyment out of the trips, tried to do as he ordered.

Fortunately, there was plenty to enjoy. We had a similarly humbling reception in Chicago, where Mayor Daley drove out to meet us at the airport then took us on a tour of the city. Chicago was—and is—very ethnically diverse, and Daley wanted us to visit every neighborhood. It seemed that every different group had their own cultural celebration that day. Now *this* was my kind of thing. I could party, eat, drink, and outdance them all. It wasn't really Dave's scene, but I loved it.

Then we were whisked to a large formal dinner with the mayor. I'd vaguely remembered that Bob Lawrence, the pilot I'd known from astronaut selection testing, was from Chicago. Barbara, his widow, still lived there, so I invited her to the gathering. It was only by chance that Bob had died in a plane crash four years earlier. He could have just as easily have been a NASA astronaut returning from a triumphant trip to the moon and fêted by adoring crowds. I enjoyed a long chat with Barbara that night, sharing my memories of her husband.

I also called Eddie Fisher that day. The popular singer had come by the astronaut office whenever he was in Houston, and we'd become sort of friendly. He invited us to his late show and saved a table for us. By the time we disentangled ourselves from the other celebrations and made it to his theater, we were an hour late for his show. We snuck in, hoping not to disturb a show we assumed was well under way.

But it wasn't. Eddie had held the show until we arrived, then came over and sang at our table. It was the kind of star treatment we were not used to, and I doubted it would ever feel normal.

NASA provided framed souvenir presentations for us to give away at every stop. Every dignitary from President Nixon on down received a flag that had journeyed with us to the moon and back. Many

were specially flown, such as a United Nations flag for the UN. Mayors generally received the flag of their state. NASA didn't ask, or seem to care, what happened to them after they were presented.

We received the star treatment in every stop we made in America, and then we headed to Western Europe. The people there seemed just as proud of us, which is exactly what we had hoped. We had flown to the moon as Americans, but we explored for the whole world. We hit England, France, Austria, Germany, and Belgium for another dizzying round of meeting world leaders, royalty, and speaking at scientific institutions. It was fun, but my favorite moments were between stops, where in some little village in the middle of Europe, we'd halt for a simple lunch with fascinating company. I always felt in my element in a room full of informal, fun-loving strangers, all eager to show us a good time. Plus, in England, I reconnected with many of my friends from the test pilot school days. It felt wonderful to see them again and share what had happened to me in the last five years.

I was alone, while Dave and Jim had Lurton and Mary with them. Lurton was great company, a very special lady whom I adored. Dave was lucky to have her. And Mary always took care of me. If I were asleep on an airplane on some long flight across the world, Mary would be the one to tuck a blanket around me and make sure I was okay. Lurton and Mary made me feel like family.



*At the White House we present President Nixon with a flown item from our mission.*

While in Rome, we had a private audience with Pope Paul VI. He was a tiny man, but had a special aura about him that only a few global leaders possess. We had an entourage of about twenty government people with us, and as he came down the line greeting us all, he stopped, looked me in the eye, and said, "Hmmm, I know you from somewhere."

That flummoxed me. I think I would have remembered if I knew the Pope, and I didn't. "You are very familiar," he added, leaving me lost for words.

Was the Pope playing a "Gotcha" trick on me worthy of Wally Schirra? Then he remembered. He



had seen me on Fred Rogers' show. I didn't know which was more surreal: that the Pope thought he knew me or that he recognized me from American children's television. To this day, I wonder if the Pope was playing a practical joke.

Our next visits were a real step into the unknown. Communist Eastern Europe was technically "the enemy" during the Cold War. Most of it was under the control of the Soviet Union—some parts more willingly than others—and Moscow was never too keen about friendly connections to the West. The international significance of the Apollo program made us the ideal ambassadors, it seemed, to journey there without tension. On these visits I grew to understand that the whole world appreciated our exploration of the moon. There may have been political disagreements, but when it came to the individual people who flew in space, it felt like we all cheered each other on.

I had more fun in the communist countries than I did anywhere else overseas. Our hosts were often reserved and formal at first, but soon loosened up. In fact, at one party in Poland we had the whole room, including our Polish hosts, playing an interesting Cold War version of hide-and-seek. We looked for, and found, all of the hidden microphones.

One night early in the visit, I decided to take a walk around the block with one of the ladies accompanying us from the State Department. As we stepped out of the lobby and headed down the street, we noticed a shadowy figure lurking behind us, wearing a trench coat and wide-brimmed hat. We stopped and looked at him. He also stopped and waited for us to grow bored. We started to walk again. He followed once again. We had a tail.

We beckoned him to join us; we would be glad of the company. But he wouldn't come. So we jogged back, put ourselves on either side and forced him to walk along with us. It turned out that he was responsible for ensuring we didn't inadvertently get into any trouble. Our hotel was across the street from a sensitive military defense building, and if we had wandered down the wrong alley we might have caused a diplomatic incident.

Our tail, I was told, was the number two person in the Polish secret police. He certainly had power. We would be having lunch with a university president or other important person, but when this little guy made a subtle hand signal, our hosts knew it was time to wrap up the hospitality. It was time for us to leave, however enjoyable the conversation. The guy had the country under his thumb.

And yet, on the last day of our trip, he pulled me to one side, and whispered, "Any chance you could find me a job in the United States?" I wonder what he was doing by the late 1980s, when communism finally crumbled in Poland.

In Yugoslavia we were guests of President Tito at his mountain resort in Bled. I grew to love skiing again while there. It had been years since I'd had time to indulge myself in the sport. We also rode horse-drawn sleighs and took hunting trips in the beautiful forests. Every time we went out to dinner, we ended up singing and dancing with the locals. They were great people, and I had a ball.

Of all the travel, meeting kings, queens and world leaders, the most meaningful trip to me was the visit back to my home town of Jackson. It was literally a red-carpet welcome, and the press reported that more than 21,000 people turned up to see me. I rode through town in an open-top limousine with my daughters next to me, waving at the crowds, while four jets flew over in salute. I ended up staying for a few days at my parents' house. As I turned in for the first night back home, I could only marvel at how much I had experienced since I left town.

In February of 1972 the president welcomed us back to the White House, to report on our overseas trips. He seemed keen to hear about our impressions of the communist countries we had visited. After we told him about our travels, he asked where we would like to visit next. "Mars!" I replied with a laugh, a not-too-subtle push for him to increase the NASA budget. The whole room burst out laughing.

“Well, I must tell you, we’re awfully proud of you,” the president added. “There are lots of people here who appreciate you. And there is still a fascination with it ... a fascination with you as people.” He then talked with enthusiasm about the space shuttle and how it could increase the kind of international cooperation we’d been encouraging on our trip. “We’ll be calling on you!” he added as we left the Oval Office.

You may wonder how I can recall this conversation so clearly. Well, it’s not every day that the president tells you he is proud of you. But there is another reason. President Nixon secretly recorded his phone calls and meetings at the time. Some of those tapes would come back to haunt him, forcing him to resign in shame just two years later. Other recordings are more innocuous, and they include our meeting that day. Listening to it now—and it has long been declassified—more than anything I hear laughter, as we relaxed and enjoyed the company of a man praising us for our efforts to represent our country, both in space and overseas.

I had done little public relations before the flight. The travels after our mission took up most of the year, so I felt very seasoned when I returned to Houston at long last. However, the extra publicity brought some unwanted attention: before long, I discovered that I had my first stalker.



## CHAPTER 12

### RUIN

I was eager to get back to work. After all, pilots and astronauts want to fly, not give speeches. But as I searched for my next role in Houston, I began to receive disturbing letters from a woman in England. She was in a mental hospital and wrote to me about imaginary animals—mostly elephants, I recall—that walked through her room and on the walls. I turned the letters over to our security officers.

The letters kept coming. She was now out of hospital, she told me. One letter enclosed the key to her apartment and told me to visit when I was next in Europe. I continued to turn over the letters to security.

The last letter said, “I am on my way.” I didn’t know what that meant, but I grew very concerned. My two young daughters lived right across the street from the space center, and there had been plenty of press about the location of my space-age bachelor pad. We wouldn’t be hard to find. The security team who guarded the space center stayed alert.

A couple of days after the last letter, they came across the woman walking along the fence line of the center. I don’t know how they dealt with her. I was told that they put her on an airplane back to England. I never heard from her again. If this was fame, I was not sure I wanted it.

At least there was work to do again. Dave, Jim, and I were assigned as the backup crew for Apollo 17, which would attempt the final lunar landing. Heading back into training so fast was normally a sign that Deke was pleased with your work, and you would soon rotate into a prime crew once again. This time, however, was a little bittersweet. After Apollo 17, there would be nothing left to fly. We were asked because we were fully trained, not because there was any prospect of a future moon flight.

Still, I was pleased. I intended to stick around, and the only other work then available in Houston was advanced design work on the space shuttle. I wasn’t keen on shuffling paper around the office. As a backup crewmember I’d train on real hardware instead. And if something happened to Ron Evans, on the prime crew, I’d head back to the moon for the second year running. Ron was training to perform a spacewalk and run a SIM bay. I would have enjoyed doing it again, flying over different regions of the moon.

Years of intense training meant I already knew the spacecraft inside out. However, there was no end to the geology and science experiment knowledge I could absorb. I happily soaked it up once again as I rejoined the training routine.

Dave and Jim were less keen. Dave told me he was eager to get another flight, and I sensed he didn’t want to wait until the shuttle flew. The crews for the Skylab space station missions were already assigned: no chance to fly there. But one last Apollo flight was planned after that. The Apollo-Soyuz Test Project would be the first joint mission with the Soviet Union. Dave naturally

expressed interest in it. Command of the first international spaceflight would be the crowning glory of his space career. Of course, there was no shortage of contenders for that seat. But with three flights now under his belt, Dave had increasing influence in the office politics that could decide the issue.

Jim wasn't interested in Apollo 17 for a different reason: he was ready to quit. After the relentless pace of moving from Apollo 12 right into Apollo 15, he had no interest in the training grind again. Worse, he was the backup for Jack Schmitt, the only professional geologist assigned to a lunar landing. The scientific community had pushed for Schmitt to walk on the moon for years. If Jack caught a cold, we had the feeling that Jim wouldn't replace him. Instead, NASA would spend millions of dollars delaying the mission until Jack was better. Jim had no chance to fly again. His heart wasn't in it.

A couple of years older than me and Dave, Jim had already put in twenty years with the air force, meaning he could retire from military life and draw an air force pension. Dave and I still had a couple of years to go before we could do that. So Jim began to look for something else to do. He found it in religion.

When Jim began to talk about how he had felt the presence of God on the moon, I was confused. For one thing, Jim hadn't shared this experience during the flight or on the world tour. Secondly, I just couldn't understand why, if someone felt that God was all around him in everything he did, they'd be closer to God on the moon than on Earth. I had long talks with Jim as I tried to puzzle out what he meant. The general public frequently asked us about spiritual experiences in the otherworldly realm of space, and Jim's response seemed to answer that constant inquiry a little too neatly for me. But the more we talked, the more I understood he was firm about rededicating his life to this new, spiritual direction. I hadn't felt any connection to a spiritual deity when I was in space. But if Jim said he had, then that was fine by me.

Jim grew close to a minister at the local Baptist church in Nassau Bay and began to give religious speeches around Houston in his free time. He had a direction. So did Dave, it seemed. I wasn't sure what I might do. I could stick around and one day command a space shuttle flight. Or I could go into private industry and put all of my aerospace engineering experience to good use. For now, however, I wanted to make Apollo 17 as good a flight as possible.

Then that promising world crumbled and slipped out of my grasp.

In the fall of 1971, right after the flight, I had sent Herrick his forty-four covers, keeping to our understanding. I expected him to keep his word and not sell them. Additionally, at some point during our busy travel schedule when my mind was elsewhere, Herrick called to ask what I was doing with my own covers. They were sitting on my office desk, I told him. He suggested that, for safekeeping, I send them to him so he could look after them for me in his safety deposit box. I trusted him and followed his suggestion. I was a fool.

My arrangement with Herrick was completely within NASA rules. The other deal, with Eiermann, was also under way. I understood that Dave had, as he agreed, sent a hundred covers to Eiermann, who in turn passed them to Sieger. Soon afterward, I received a German bank book in the mail with the agreed amount in it. So did Jim and Dave. I didn't give it much thought, figuring the money was safely out of the country in a foreign bank, and that I could forget about it for a few years, until Merrill and Alison were ready to go to college. I'd been assured, after all, that the covers would only be discreetly sold many years after we were out of public life.

Then I heard a disturbing report that Herrick had begun to publicly sell his covers through a stamp dealer in Connecticut. Worst of all, the news came from Deke. He had received a letter from a stamp-collecting company asking him for confirmation that the covers now on the market were genuine.

Deke, of course, asked me what this was all about. I calmly told him. With the Herrick arrangement, I had nothing to hide; I had worked completely within NASA's rules.

Privately, however, I hit the roof. Herrick had betrayed me. I wrote him a scathing letter and demanded to know what the hell he was doing, explaining that he might destroy my career with his actions. I never received any explanation. Whether he meant to do this to me all along, I can only speculate. All I knew was that our verbal agreement had been extremely clear, and I should never have trusted a guy I now realized I hadn't known at all. After all, I didn't even know his first name—and I still don't. My gut feeling about him had been completely wrong.

I didn't think it could get worse. Then it did—much worse. The covers in Germany began to hit the stamp-collecting market, too.

To this day, I don't know why for sure, because my involvement in that deal was limited to nodding my head at a dinner meeting. I heard later that Eiermann had never instructed Sieger to delay the sales for a few years, so Sieger began to sell them almost immediately to his list of private clients.

Dave did the right thing. In the spring of 1972, he told Sieger to forget the whole thing. Keep the covers, cancel the bank accounts, keep the money. The three of us wanted nothing more to do with this. We each returned the bank books. We lost the twenty-one thousand dollars by doing so. And, I should stress, we did this before NASA asked us anything about a deal with Sieger—before NASA even knew about it. The whole world of postal covers felt seedier with every passing day, but I could at least maintain a scrap of moral pride, knowing we were out of it without being told by officials to cancel the deal.

Yet we were not out of it. It didn't take too long for Deke to also get word about the German covers. While I was busy with Apollo 17 training around the country he began calling me regularly, asking me for details.

I told him everything about the Herrick deal, and suggested that the Sieger deal was best explained by Dave. Apparently Jim told Deke exactly the same thing.

But Deke kept coming back to me. "I understand that you are the stamp collector on the crew," he'd tell me, strongly implying that I arranged both cover deals. I could only explain the Herrick deal again—embarrassing, unfortunate, but I had done nothing wrong—and advise him to ask Dave about the rest.

Then Deke dropped another bombshell. He told me that Dave had said I was the stamp collector on the crew and that all questions about *all* covers should be referred to me.

What was going on? Did Dave tell Deke that I had also arranged the deal with Sieger? Or was Deke just seeing what I would say when accused? I guess I'll never know. I never questioned Dave about it. At the time, the three of us didn't talk much about the covers with each other. I think we were all trying to keep our heads in the sand, stay away from the issue as much as we could, and hope it would blow over. Plus, Dave was my trusted commander, and I assumed he would take care of me and Jim. I didn't want to believe he would say such a thing.

As our boss, Deke took the obvious next step. He called me and Dave in for a meeting. Jim was also invited but was out of town.

I think Deke still hoped, until that meeting, that there had been some kind of mistake. He had spent many years protecting his astronaut team from all kinds of outside influences who tried to steer and regulate the astronaut office. In return, he expected us to live up to the trust he placed in us. I think that is what he was looking for when we closed the door and sat down opposite his desk.

I was relieved when Dave didn't try to pin the Sieger deal on me. Perhaps Deke had misunderstood, I thought. However, Dave did not explain to Deke that he had arranged the deal.

Instead, it was presented that the crew, as a whole, had entered into the arrangement. I wasn't going to speak out and dispute that. After all, it was true that I had gone along with the deal. Plus, at the time I thought it would be wrong to rat out my commander. We were still a team, I told myself, and we had defied death together in space.

I was more concerned with the look that Deke gave us both as the details came out. He was a boss whom I trusted and highly respected. I knew he would be angry with us—and he was. I knew he would be confused and ask us what the hell we were thinking—and he did. What I wasn't prepared for was the look of hurt in his eyes. He'd trusted me to never place him in a situation like this. I had let him down. While I had never meant to, I can still never forgive myself for that.

Deke had no choice. This was the kind of situation he wasn't allowed to deal with alone; he could no longer protect us. He had to take it to his superiors, then steel himself to clean up the mess.

The word came down in the spring of 1972: the NASA office of special investigations was going to look into it. I was also informed that Chris Kraft was involved. The original flight director, Kraft was a person of immense power who was taking a step up the ladder that year to head NASA's entire operation in Houston. If he liked you, Kraft could guide you through a stellar career. If he didn't, you might as well leave. A number of astronauts had incurred his displeasure in the past, and none of them had ever flown again. They had not been fired. NASA didn't do that since it might create bad press. Instead, these unlucky guys sat around in their office for a couple of years until they realized they would never be offered another space mission.

I didn't want to become one of them. So when Kraft asked me to voluntarily turn over all flown covers to him while the investigation took place, I jumped into action. I blasted Herrick again and insisted he return my covers to me. I received only sixty, along with a list of excuses. Some had been chewed up in the mail, he told me, and had to be destroyed. The others had somehow been "lost." I couldn't believe he would destroy something that had flown in space, and I told him so. But there was nothing else I could do.

I took the sixty covers, added them to the one hundred covers that Dave had unexpectedly given me after the flight, and placed them in a large envelope. Then, to be on the safe side, I gathered up every other flown item I had in my possession and added them to the package along with an itemized list. If they were going to investigate what we took on the flight, they might want it all. Of course, the little personal items I had flown for friends had long been given back to them. But I still had many flags and other little items from my PPK. I put them all in the package and sent it through the internal mail to Kraft's office. To my mind, it all had intrinsic value.

About three days later, I received everything back except the covers. That was all the investigators were interested in, I was told, and they'd be returned to me too once the investigation ended. I was surprised that they only wanted to look at the covers.

I was nervous that an official investigation was taking place. On the other hand, crazier things had happened in the astronaut office in the past—the Time-Life deal came to mind—and I had been told that every crew before ours had signed a similar stamp deal. Surely we wouldn't be singled out? It was time to concentrate on Apollo 17. There was a lot to do.

I was in a desert in the southwest a couple of weeks later—May 16, 1972—on a geology training trip. At seven in the morning, Deke called me in my hotel room. It was a Tuesday, and I looked forward to an intense week of geology training.

"Al, here's the deal," Deke began. "I have good news and bad news. The good news is that the air force will take you back."

Oh, shit. I knew what Deke wanted me to ask. "What's the bad news, Deke?"

“You have got to be out of your office by next Monday. You’ve got to be gone. Get yourself back to Houston today. I have already turned your name in to the air force for reassignment.”

There was no opportunity to discuss, to argue, to plead. The conversation was over. I was in shock. Astronauts didn’t get fired. Well, guess what? I’d just been fired.

I had plenty of time to think it over as I flew back to Houston, still numb. I could guess what Deke was trying to do; by sliding me back into the air force, he could divert the flak away from NASA and report that the issue was resolved. He was probably also trying to protect me, by getting me away from the investigators. But I didn’t want to go back to the air force. I’d been to college, to England, and then on loan to NASA; I had been out of the military mainstream for a long time. All of my peers had built up impressive combat records in Vietnam. And I’d noticed that Deke had said the air force “would take” me back—not that they *wanted* me back.

When I returned to Houston, I followed Deke’s orders and called the air force personnel office to find out my options. On such short notice there weren’t many, they told me. They could assign me to the Air War College in Alabama for a while, then possibly move me into a public relations role at the Pentagon. Neither of those options sounded too appealing.

I figured I had nothing to lose by talking to Chris Kraft, so I headed to his office on Wednesday. I didn’t expect to be welcomed with open arms, but neither did I expect what happened next. The decision to release me was a management decision in the best interests of NASA and Houston, he told me. All of NASA management concurred. He would not move me into a desk job, and I should go back to the air force. Then he really let rip. Now that I had made my flight, he growled, I was “just another dime-a-dozen engineer. I want you out of here as soon as possible. And don’t let the door hit you in the ass on the way out.”

I returned to my office and, not knowing what else to do, wrote down everything Kraft had said to me. I was still in disbelief. My God, I thought, it really is all over.

I tried to puzzle out why Kraft felt so determined to humiliate me. He was inheriting command of the most well-known NASA center, and the first thing on his work pile was to sort out the mess of the covers. That would annoy anyone. We’d let NASA down. But to what extent? Had we disgraced the whole program? Had we killed anyone? There was more to it, I felt sure. But no one would tell me.

Deke had fired me and told me to be out of the office by Monday. Screw it, I thought, I am not leaving. What could he do? Fire me again? Have security escort me off the premises? I stayed and continued to talk to people further and further up the chain of command. I didn’t see it as embarrassing myself or them. I’d risked my life for NASA. I’d lost my marriage. I’d busted my butt flying on what people had told me was the pinnacle of NASA’s science and exploration efforts, and done it well. I figured that earned me at least a couple of weeks to work out what to do next before I was thrown in the trash.

I took a deep breath and headed to the office of George Low, the NASA deputy administrator. I had always seen George as a friend. I began to explain to him what had happened. But he didn’t care. “We are a clean organization,” he told me icily, “and you did something bad. We are going to show the world that we’re getting rid of you. You need to go back to the air force.”

I was ready to leave his office when George stopped me. “One other thing,” he added. “I made sure to add enough bad remarks in your air force file that you will never be promoted again.”

That parting shot almost broke me. I was devastated. I sure as hell wasn’t going back to the air force now. If NASA had helped me make the move, I probably would have gone quietly. But George had just deliberately killed my career stone dead. So why do what he wanted me to do? I grew more stubborn.

After making more careful notes about my meeting with George, I headed for a meeting with Jim Fletcher, the NASA administrator. Like Kraft, he was relatively new to his position. Jim, at least, was polite with me. But he sidestepped my questions. "What's wrong with returning to the air force?" he asked me. "You'll be fine. Go on back."

There was nowhere else to turn, I thought. I was in a most ironic of circumstances. I loved NASA. And despite the humiliation poured on me by its leaders, I was fighting to stay.

Jim Irwin received the same treatment, but he didn't need anything more than a word from Deke and he was gone. Jim already planned to retire when Apollo 17 was over. So when Deke asked him to move his retirement date up, Jim had no problem doing it. With Jim leaving, we were all pulled from Apollo 17 duties and three other astronauts were assigned to replace us.

It was quite clear I needed to get the hell out of Houston. But NASA was where I felt at home. If I had to work my way through a lot of antagonism and mean-spirited comments to stay, I was prepared for that. However, I was running out of people to talk to.

I considered Dale Myers, the associate administrator for Manned Space Flight, to be a friend. But then I had thought that about George Low, too. I requested a meeting with Dale and steeled myself for another humiliating lecture.

To my immense relief, when we met on May 31, Dale was friendly and sympathetic. "You need to get out of Houston," he agreed. "I'll see if I can find you a job at another NASA center and hide you there. Where would you like to go? Huntsville? The Cape? Langley?"

I could have wept, I felt so grateful for this act of kindness. We talked about the different centers and settled on the Ames Research Center in California. They did a lot of flying there, and it was far enough from Houston and NASA Headquarters that I could evade the witch hunters. "Go and talk to the director out there, and I'll arrange the rest," Dale told me.

I flew out to Ames, south of San Francisco. It's a beautiful part of the country, not far from hills covered in redwood forests, and I mentally crossed my fingers that the job interview would go well. I hit it off with Hans Mark, the director of Ames, immediately. He took me around and showed me the hypersonic wind tunnel they used to test space shuttle designs, and the space medical studies. Of most interest to me was their airborne science division. They had a whole fleet of aircraft used to perform in-flight scientific experiments. It looked great to me, as it was similar to the research I had carried out in lunar orbit. We agreed that I would start work there in September.

In the meantime, I was still in Houston and wondering why I had fought so hard to stay. I was a pariah in the office. None of my fellow astronauts wanted to talk to me. They were mostly polite, but reserved and distant. It was clear I wasn't welcome at the weekly astronaut meetings, so I stopped going. I was toxic, tainted. But I understood the deal. This is what had happened to others before me. It was as if I were a pilot who had brought dishonor to his squadron. My colleagues were just protecting themselves and their careers. They couldn't be associated with me.

Even Dave, whom I expected to talk with me, no longer dropped by. That hurt me. Dave had been an incredible mission commander and was *always* in charge. Even after the flight, on our world tour, he had made it very clear that we were to follow his orders. With such command, I figured, came responsibility. Dave had led me into the covers deal with Eiermann and had told me it would be fine. I hoped he would now tell my superiors what had happened and sort out the mess. But he wasn't even talking to me.

My parents, on the other hand, stayed very supportive when I discussed it with them. They felt sad for me, coming so soon after the parades and celebrations. But they were also realistic and stoic types. It happened, it's over and done with, and now you have to move on, they told me. Don't brood



over it, pick up the pieces of your life, and move on. When I thought about the many tough times in their lives, and how they had kept plowing forward, I realized it was good advice. I needed to persevere and I would come out the other end alright. There would be—there *had* to be—brighter days ahead.

First, however, my world grew darker. Before I could make the move to California, I was informed that Dave, Jim, and I would be required to appear before a Senate committee in Washington, D.C., on August 3, to testify about the covers. Members of the Senate Committee on Aeronautical and Space Sciences had seen newspaper reports about the covers and began to question Jim Fletcher. The Justice Department started to investigate, too. Stories swirled in the press that listed varying numbers of covers, incorrect details, and wildly speculative amounts of money that were supposed to have changed hands. NASA statements to the press gave differing cover numbers, too. No wonder the committee wanted to ask questions of us directly.

On July 11, a few weeks before the hearing, NASA publicly issued a reprimand declaring that the three of us had “exercised poor judgment in their action.” I couldn’t argue with that. The next day, news reports stated that I would be “reassigned from the astronaut corps to another position within the space agency,” effective August 1. It seemed that my bosses were backing down; I was spared further public humiliation. Two days later, John Donnelly, a NASA spokesperson, officially told the press that “there is no evidence at all” that I profited in any way from my arrangement with Herrick. I was grateful for the partial vindication.

On July 26, the anniversary of our flight, Dave moved into a desk job. It was a prestigious position: technical assistant to the manager of the Apollo spacecraft program. Nevertheless, when reporters asked NASA spokesperson Jack Riley if Dave had no choice about remaining an astronaut, he responded “That’s right,” adding “It was decided he would be transferred from the astronaut office.” The press pounced on these often-contradictory stories from different NASA sources. It was chaos.

We began to hear more details about the forthcoming Washington hearings. As well as the Apollo 15 crew, the committee would call Jim Fletcher, George Low, Dale Myers, Chris Kraft, and Deke to testify. Legal matters would be addressed by Neil Hosenball of NASA’s legal counsel. This was going to be *interesting*.

Deke was pissed that he had to go before Congress about this issue. Years later, Wally Schirra gave me a copy of a letter Deke wrote to him a couple of weeks before the hearings. Deke was sending his copy of each mission’s PPK lists back to their respective commanders. In the accompanying letter, Deke told Wally that the authorities were leaning on him.

“Demanding I release all lists for Senate hearings next week, and I’m refusing. My position is the lists as well as contents are crew property and not my prerogative to release. Legal people tell me if NASA doesn’t fire me in the meantime, Senate could get me for contempt. My solution is to turn lists over to crew commanders so there’s no way they can force them out of me. You can burn, use in bathroom or whatever. Possible someone may come to you for them but it’s your property and your choice. Only way I would release is to get each crewman’s permission and haven’t got time for that before they put gun to my head.”

Reading the letter, I felt a new respect for Deke for pushing back against the pressure from the investigators, as well as a new wave of sadness that he had been placed in that position. Especially when I read the very last line. “Come see me in Leavenworth—love, Deke.” The reference to the maximum-security prison was only half joking.

I flew Jim up to Washington, D.C., in a T-38 the day before the hearings. Jim had retired from the air force just a couple of days before and was preparing to leave NASA. We agreed that we would

tell the committee everything. But we also felt nervous. If these senators didn't like us, they might do their best to have us locked up for a long time.

We joined Dave, and then the three of us met with Julian Scheer, NASA's head of public affairs. What a nightmare we were handing him. However, he was pleasant and reminded us that we were entitled to attorneys. We decided against it. We'd take what was coming to us.

Dave was once again the commander and in charge. He was pissed that Jack Riley had said he was moved out of the astronaut office against his will. Not true, he insisted. We needed to give the committee a clear story, he told us, and stop all these rumors in the press. We would go in there as a crew and we would answer for our actions as a crew.

Jim and I didn't argue. We felt guilty about going along with the covers deal and figured we would sink or swim together. We were good soldiers, and once again we'd follow our commander into danger. So while we told the committee everything, we chose not to specify who had arranged the Eiermann deal.

The next day, we sat before a panel of seven senators. They began by praising our work on the Apollo 15 mission. I felt embarrassed: the last time I had spoken before a group of senators, I had been addressing a joint meeting of Congress and had received a standing ovation. I doubted that was going to happen today.

We were told that the meeting was merely an opportunity for us to explain our actions—we were not on trial. However, the committee reminded us that we were entitled to legal counsel and we could refuse to answer, because our statements could be used in future legal proceedings.

Press reports from the fall of 1971 were entered into the official record. They included something that *really* got my attention. Apparently the same issues had arisen on Apollo 14, Al Shepard's flight. According to the reports, the Franklin Mint, a commercial company, had offered two hundred silver medals to the public if they signed up with their collectors' club. The advertisements said the medals contained metal flown to the moon on Apollo 14. Congresswoman Leonor Sullivan had demanded to know what was going on at NASA. The NASA heads had denied responsibility and blamed the crew. Forced to respond, Deke told Sullivan that it was "unlikely" that other items flown in space would be sold "because most of these things are treasured heirlooms."

Deke had also made a statement to the press, saying the agreement with the mint was "an unwritten gentleman's agreement," which sounded all too familiar. He had then added, "I take full blame for the coins, since I was responsible for everything that went along on the Apollo 14 flight. We have an understanding between the guys in the flight crew and ourselves that they won't commercialize medals they have on the flight. It's my job to make sure that things in poor taste don't get on the ship. This is the first time that anything commercial has happened, and we aren't about to do it again."

Now I understood a little more why Low, Kraft, and Deke were so angry with our crew. They had just finished dealing with a scandal that had reached congressional ears, and Deke had promised them it would be the last time. Now they were back again, forced to explain another incident. The committee was questioning if they had any control over their employees.

Why hadn't I heard about the Apollo 14 incident before? I'd been deep in mission training, frequently out in California, and out of the office loop. Plus, I was forced to conclude, no one in Houston had talked about it. After all, what happened to Al Shepard because of the medals? Nothing. After the flight, he resumed his duties as chief of the astronaut office. Apparently, he was untouchable. And I wasn't.

Another gentleman's agreement was also of interest to the committee. With Deke's blessing, Dave had placed a tiny sculpture on the surface of the moon that symbolized all deceased astronauts and

cosmonauts. I thought it was a beautiful gesture—my friend C.C. Williams was now memorialized forever on the lunar surface, along with the cosmonauts who had died just before our flight. But the sculptor had decided to go public and sell copies of the sculpture. NASA wasn't happy, and neither was Dave. This seemed to be the equivalent of my Herrick deal, a handshake oral agreement gone wrong.

The sculpture was named *The Fallen Astronaut*. That title could have described the three of us just as well. To the committee, it was just another example of a lengthening list of commercial deals that involved Apollo flights.

Clinton Anderson, the committee chair, was also informed by Jim Fletcher that Al Shepard had carried two golf balls to the moon with him, only one of which Deke had approved. Now, I *had* heard this story since I'd returned from the moon. There was a rumor in the office that Al was in covert discussions to allow the golf ball manufacturer to publicize their connection with the space program. That wasn't going to happen now.

Fletcher also told Anderson that Dave had "carried a Bulova chronograph and a Bulova timer on the Apollo 15 flight, and these were not approved as items to be carried on the flight." Only two people at NASA knew about them, Dave explained: he and Deke. And even Deke didn't know until after the flight. Dave had decided to "evaluate" them in flight, he said, following a personal request from an individual within the company. The committee seemed suspicious. But Dave assured them that he had not planned any commercialization of the timepieces.

When it came to the covers, Jim Fletcher explained that all of mine had been authorized by NASA management to fly on the mission. "Everything was authorized with the exception of the four hundred on Colonel Scott?" one of the senators asked. "Correct," Fletcher replied.

The senators asked if we had broken any laws. No, Neil Hosenball responded, possibly some administrative rules, but nothing illegal. Had we profited in any way from the covers? "They did not profit," Hosenball confirmed.

The senators' questions then moved away from us and firmly onto Fletcher. They seemed more interested now in NASA's chain of command. They were critical that NASA seemed to have no clear regulations in place. If regulations were broken, managers were not informed until months later, they noted. They were puzzled that NASA's legal team kicked the entire matter over to the Justice Department as if they couldn't handle their own mess personally. And they were unimpressed that their committee had learned about the issues by reading reports in the newspapers, not from NASA.

I watched Fletcher, Low, and Kraft squirm at these retorts. I felt sympathy only for Deke. His informal, unregulated system had been deliberate, to allow his fellow astronauts great freedom. He'd stuck his neck out for us. "Our feeling is that they are all mature adults," he told the committee, "and it certainly is not our prerogative to tell them whom they can associate with socially." And now, because we'd let him down, upper management would no doubt force a new set of rules and regulations on him and never allow him the freedom to manage the office again.

Deke was honest with the committee. They asked him if he would have approved the extra four hundred covers for flight if Dave had asked. Yes, he answered, even though the admission was now likely to get him into more trouble. "There was no law that had been violated," he explained, adding that he took full responsibility for not immediately informing Kraft and Fletcher about possible issues with the covers. "We have done similar things on similar occasions," he admitted. He even apologized. My admiration for Deke grew. He could have dumped the whole mess on us. But he was too honest for that.

Deke also explained how hundreds of items such as patches flew on every mission and were given

to NASA employees and contractors. He explained that “there has not been any effort on our part to control what the crew did with these items. I think we considered them their personal items.

“We cannot guarantee what any person will do who is given one as a memento,” he continued. “We hope he will retain it as a personal memento, but we cannot control what he will do with it.” The committee even noted that they had personally received flown state flags following space missions, some of which were framed on their office walls.

Deke was then asked for the inventories of the PPKs. He told the committee that he no longer had them; only the mission commanders did. If the committee wanted to see them, they would have to call in each commander personally. On this issue, Deke had politely told the committee “none of your damn business.” He got away with it.

Senator Stuart Symington asked us about our educations and whether we had attended service academies. With that type of military education, he noted, did we not know that such a deal was wrong? My mind went back to the West Point honor code. Should I have told Deke about the deal as soon as it was presented to me? If so, would that have stopped our crew from flying to the moon? I guess I’d never know now.

Dave was asked to tell the committee how the covers deal had taken place from start to finish. He explained that Eiermann had become a “rather close friend” of his. He admitted that the deal was wrong. The rest of his testimony, however, was mostly “we,” as a crew. This included his initial account of making the three hundred extra covers, as if Jim and I had known about it.

I had agreed with Jim and Dave that we should take our punishment as a crew. Nevertheless, I imagined that, at some point, Dave might tell the committee how he had pulled Jim and me into the deal. That moment never came.

Dave didn’t evade the blame heaped on the crew as a whole. “I have no excuses for why we did it,” he told the committee. “We just made the mistake, sir. I regret that we did it. I do not understand why we did it. We know better.” Dave answered a little differently only when pressed directly and repeatedly by Senator Margaret Chase Smith about the four hundred covers.

“Were you responsible?” she finally demanded. “The other two were not?”

“Yes, ma’am, I was responsible,” Dave admitted. “I have to accept the responsibility.”

I was glad he’d finally said it. But the moment passed, and the committee moved on. They asked Chris Kraft if Dave and I were moved out of the astronaut office as part of disciplinary action resulting from the covers incident.

No, Kraft replied, and stated instead that we were being moved where our technical expertise would be of most use while the Apollo program wound down. That answer was unexpected. I remembered the meeting I’d had with Kraft and his evaluation of me as a dime-a-dozen engineer unfit for a management role. It seemed the official story would be played out differently. But I had no doubt that Kraft’s wrath would return the moment I returned to Houston.

Senator Anderson told the press after the hearing that our testimony had been “forthright and complete.” They reached no conclusions that day, but planned to study the issues in more detail, including further examination of whether we had violated any laws. Fletcher, in the meantime, had told the members of the committee that no decision had been made on what would happen to the covers, but they were in a “safe place” until it was decided. Of the covers made by Herrick, Hosenball told the committee, “I think the Justice Department will have to issue you a ruling. If their ruling is that they belong to Colonel Worden, they certainly will be returned to him.” His conclusion was that “he probably does own the covers.”

Senator Barry Goldwater, also on the committee, wrote to Jim Fletcher after the meeting with a

formal request. If we had broken only NASA regulations, he suggested, the letters of reprimand placed in our military records should be rescinded so that our military careers were not destroyed. Goldwater's request was never honored.

The hearings could have been worse. I'd been prepared to be taken out and shot. The committee seemed much more annoyed with our bosses than with Dave, Jim, and me. And with the hearings over, we parted ways as a crew. We'd planned on being in the history books—and we'd succeeded—but we'd never imagined our partnership would end on this low note.

I flew back to Houston that evening. Dee O'Hara was at Ellington Field to meet me, along with Beth Williams and her daughters. They were the only people in town still talking to me. I felt emotionally drained and seeing them there cheered me up. We chatted over hamburgers and Cokes before I climbed back into a T-38. I was heading to California to prepare for my move there.

By mid-September, NASA released its last official statement on the covers issue. In addition to repeating statements about our poor judgment, it added that "some of the management communication lines within NASA were weak, and that certain administrative procedures were deficient."

In the meantime, NASA's investigators discovered that twenty astronauts had previously signed postal items for Sieger in exchange for money. Kraft briefly suspended a number of them, although some had already left NASA service. Each astronaut had signed at least five hundred stamp blocks; some had signed more. Many had given the money directly to charity, but not all. One guy lost a spaceflight assignment because of it. But no one was fired.

Astronauts on prior flights gathered up their flown covers and put them in safety deposit boxes for a couple of decades. Would you like to know how many covers flew on missions prior to Apollo 15? I doubt you ever will. Once Deke returned all the PPK lists, the trail went cold for the government investigators.

The brief public glimpse into Al and Deke's management techniques was also closing. By November, that door was firmly shut. Alan Shepard, in his role as the chief of the astronaut office, wrote a public letter to an American stamp-collecting group who felt they should have been included in selecting postal items carried to the moon. "I cannot believe that your group would deny the astronauts the privilege of carrying whatever items they desire, including philatelic material, for their personal, non-commercial use," he wrote. In short, none of your damn business.

By then, however, I was gone. Moving out of Houston was a bittersweet experience. I had little to hold me there anymore. My apartment was rented. I'd even traded in my white Corvette that symbolized our Apollo 15 crew's teamwork and leased a new model. I hooked a trailer on the back and loaded up my possessions.

Only two things made me want to stay: my daughters and a relationship.

Merrill and Alison were very upset I had to leave town. They lived only half a block from me, and with the flight over I'd been able to spend more time with them at last. They were old enough to understand a lot of the covers scandal, but they didn't care about that. They didn't care too much about flying to the moon either—everyone's dad at school did that, or worked with someone who did. They *did* care that I had to move to California. They were heartbroken, and so was I. But Houston wanted me gone.

I'd fallen in love again, too. I hoped this lady would want to come with me to California. But her life was in Houston, so she didn't. With much regret, we ended the relationship. It was another blow to add to my deep sense of failure.

Heading down the street to leave my neighborhood, I had to pass the space center. They didn't want me anymore. No one had said good-bye. It was as if I were a ghost. Some of them, like Deke, never

spoke to me again.

I'd arrived in Houston six years earlier feeling I'd gained the greatest job in the world. I left wondering if life were still worth living.



## CHAPTER 13 REDEMPTION

To the outside world, it appeared that NASA had happily transferred me. But when I arrived at Ames Research Center, it seemed evident that I still had to go through a period of penance for daring to stay with the agency. Hans Mark assigned me to a tiny office at the very end of an enormous hangar, with crumbling paint, smudged walls and one little window that looked out on to the hangar floor. It hadn't been used, or cleaned, in years. No one knew I was there. My boss in the airborne science division insisted that I give him everything I wrote for him to sign and pass up the chain of command. I sat in that office day after day and felt more alone than ever.

The center announced that they would host a meeting on space shuttle simulation work, and "an astronaut" would be in attendance. Unlike at Houston, this wasn't an everyday occurrence, and a number of Ames workers grew excited. It turned out to be Karl Henize, who had yet to fly in space. It felt peculiar to see Karl lauded as *the* astronaut. No one at Ames seemed to think of me that way.

But the hangar was a good place for Hans to bury me while all the media interest about the covers ebbed. And the work was really interesting. It was a combination of the science experiments I had come to enjoy on Apollo 15 and rewarding flying time in a variety of aircraft. The airborne science group had a couple of Lear jets and an enormous Douglas DC-8. But they were dwarfed by the C-141 Starlifter. This specially modified airplane had a huge infrared telescope built in, and our research pilots flew it to the highest possible altitude, rolled up an opening on the side, and wearing oxygen masks, helped astronomers with their discoveries. We modified a Lear jet to do the same, installing a smaller infrared camera in the side. My workday often began at two in the morning, but the night flying was beautiful.

In December 1972 I did sneak back to the Cape for the launch of Apollo 17, the very last manned mission to the moon. It was a bittersweet moment. If it hadn't been for those covers, I would have been strapping the crew into the spacecraft. Instead, no longer an astronaut, I watched as just another spectator. I went to a couple of the parties in Cocoa Beach, and Deke Slayton was there, but I didn't try to speak to him. I felt a little awkward around him.

After about a year of hiding me in the deepest bowels of NASA, Hans promoted me. He quietly moved me over to an administration building and put me in charge of the futures forecasting division. Hans gave me forty talented people to manage, each of whom could look at cutting-edge science and engineering developments and report on how they might fit into NASA's future plans. It was exciting work. Similar forecasting groups had tried to work in Washington, D.C., but they had found too much political pressure there to make objective reports. Out in California, away from the spotlight, technologies were much easier to assess fairly.

Hans was friendly, supportive, and seemed impressed with my work. After a couple of years, he

put me in charge of the entire airborne sciences group. In addition to the astronomy work, we flew the Lear jets in zero-G parabolas to perform biological measurements. It felt nice to be weightless again. I also had three Lockheed U-2 reconnaissance airplanes. The U-2 had formerly been used as a spy plane to overfly the Soviet Union. We flew ours over agricultural areas instead. NASA used satellites to examine land use and gather crucial information about global food supplies. We proved that U-2s could provide information that was both clearer and cheaper.

Ames was a fascinating place—full of smart people who did impressive work, from cutting-edge flying to searching for evidence of alien life. But I was always curious about what was taking place in Houston. Dee O'Hara kept me in the loop. She never judged me or abandoned me. And a couple of years after I left, she was also growing restless. With the moon landings over there was little to do in Houston, she told me. The space shuttle was delayed; it would be years before it flew. Why not join me at Ames, I suggested? There was plenty going on there in the field of life sciences, her specialty. I helped set up an interview with our medical operations team, and they loved her.

I flew to Houston and drove Dee and her belongings—including her dog—out to California. It was the middle of the energy crisis, so we drove as long as we could, then waited in long lines at the gas stations until we could scrounge more fuel. It was a fun adventure, and we eventually made it to Ames. Dee has never left. She still works there as one of NASA's longest-serving employees—and one of my best friends.

In the meantime, many officials who had honored our Apollo 15 crew left government office in disgrace. In October of 1973, Vice President Spiro Agnew resigned under a cloud of bribery allegations. Nixon needed a new vice president. And he chose Gerald Ford, the Michigan congressman who had helped escort me to the podium for my celebratory speech to Congress. Now someone needed to replace Ford.

Two other congressmen from Michigan called me to Washington to talk with them. Would I consider moving back to Michigan to run for his seat as a Republican, they asked? The next thing I knew they took me down the corridor to talk it over with Ford. He seemed keen for me to give it a shot and promised his support. I said I'd think about it.

Ironies were piling on ironies, I thought. I'd been honored by Congress, then questioned by them for wrongdoing. I'd been honored by a vice president who was then forced out for wrongdoing, and now I was being asked to help replace him. At least, I thought, this was a sign that the stain on my character following the covers incident must be lifting. People were thinking of me again in relation to the Apollo 15 adventure, not that damn little package of envelopes.

In the end, I turned the offer down. I would have had to give up my military pension, and I was only a couple of years away from the required two decades in the service. Plus, I wasn't convinced I could win. The seat was traditionally a very safe Republican stronghold. No Democrat had won there since 1912. But times were changing: Nixon was plagued with his own scandals. Sure enough, in the spring of 1974 a Democrat won Ford's seat in a huge upset, running on an anti-Nixon platform. It was a foreshadowing of further trouble that year for Nixon and the Republicans, which culminated in Nixon's resignation that summer. Less than a year after my conversation with him, Gerald Ford was president.

I felt sorry for Richard Nixon. He'd been wonderful to me and my family. At the same time, I recognized he had brought his troubles on himself through behind-the-scenes deals and had been caught. But in reality I didn't have too much time for national politics. I was more interested in what was happening to Dave Scott.

It seemed that Dave had shrugged off the covers scandal; he was promoted to important positions



within the heart of NASA. By 1973 he was heading a technical delegation to the Soviet Union, working on ways for Apollo to dock with a Soviet spacecraft. This was not only a great technical assignment, but also important international diplomacy. Dave was soon promoted again to deputy director of NASA's Flight Research Center at Edwards Air Force Base. This was a coveted assignment, since cutting-edge experimental flying took place there.

I tried not to feel sorry for myself. I'd landed on my feet, after all, and was doing interesting work. But it was hard for me not to make comparisons. Jim and I had stuck by our commander as loyal crewmembers. We'd been told to get the hell out of town. Dave got to stay—not only stay, but he was *promoted*. It was tough not to feel like I'd been screwed over.

I had been very naïve. I had believed all of those pep talks about acting as a crew. It was so deeply ingrained in me to follow my commander—in the military and in NASA—that it took me years to realize it had all just been bullshit. What had that loyalty got me? Nothing.

But it could be worse, I thought. I could have been Jim.

Jim's ministry had been a phenomenal success. He asked me to join the board of his foundation, and I agreed. He was in demand worldwide to talk about the moon and his religious experiences. His schedule wasn't unlike the world tour we'd taken after Apollo 15. I heard Jim's speeches, but I didn't always agree with his viewpoint. For years he tried to make an analogy between the twelve people who walked on the moon, and Jesus's twelve disciples. He repeatedly tried to gather the twelve astronauts for a religious retreat, believing they were somehow specially chosen. Of course, the other twelve of us who had flown to the moon without landing found that a little strange. Jim never did gather his twelve moon walkers in one place.

Perhaps it was the stress of the nonstop travel, or possibly the aftereffects of the physical demands of our flight. Whatever the reason, Jim had a heart attack in the spring of 1973.

Jim called me from his hospital bed. He'd scheduled a large number of speaking events and didn't want to let those people down. Could I fill in for him?

I couldn't give a religious-themed speech the way Jim did. I was also busy with my own work at Ames. It would have been easy to turn him down and not feel guilty. But Jim was my crewmember and my buddy; I wouldn't let him down. I stepped in, and while he recuperated I gave speeches in his place. I talked about our flight and general themes of humanity getting along as a species, as a planet, despite religious and political differences. It seemed to go down well, and Jim was forever grateful that I was there when he needed me most. His ministry survived.

I also gave some time to a writer who frequently stopped by. His name was Tom Wolfe, and he'd visit San Francisco for two or three days at a time and head down to Ames to see me. He'd already grabbed me once for a coffee and a chat when I'd been at the Cape for a launch, but now Tom wanted to talk in more depth. We'd sit around my house, play cards, and chat. Dee often joined us. The guy was a sponge for information about the space program and was writing a magazine article called "Post-Orbital Remorse," examining how some astronauts had a tough time deciding what to do with themselves after the incredible experience of spaceflight. I could relate, although for very different reasons. I poured my soul out to him. Tom talked to many astronauts and eventually expanded and changed that article into a full-length book called *The Right Stuff*. It was an outstanding read.

I had my own, personal post-astronaut remorse to deal with. By 1975, I'd been in the air force for twenty years. They had been good to me. For almost half of that time, I'd been on loan to NASA. The air force had also been ready to take me back after the covers scandal. But I had essentially lived as a civilian for a decade while at NASA. I knew I'd never be promoted after what George Low told me he'd placed in my file. It was time to retire.

Hans Mark had been wonderful as well, taking a gamble on me when no one else wanted to. But his bosses at NASA were not so charitable. I always sensed that I had been allowed to ride out my twenty years in the air force, but once that time was up, NASA management would be happy for me to leave.

Hans offered me the opportunity to stay at Ames once I left the air force. I could have continued to run the airborne science division as a civilian. It was not as glamorous as being an astronaut, but it was still the most senior job I'd ever had in my life. But I was so tired of NASA. Tired of the bureaucracy. I felt like I'd been beaten over the head with it for long enough. I needed to get out of the whole business and wash the sour taste out of my mouth.

My colleagues in the airborne science division threw a low-key retirement party for me. I'd already sold my home and stashed all of my possessions in a motor home parked at the back of the building. As soon as the party was over, I strolled out and drove east, back to Michigan.

Dave retired from the air force the same year. He never did get promoted to general, which must have been a crushing disappointment for an officer who many assumed would head the air force some day. But he did continue to be promoted by NASA. He stayed with the agency as a civilian and was promoted to director of the Flight Research Center.

I left NASA behind and started a new chapter in my life. For a while I worked on business partnership plans with Ed Cole, the former president of General Motors, renewing my lifelong interest in cars. Then, striking out on my own, I started an energy management company. I helped to develop a stall warning system for aircraft and sold it to a large manufacturer. I worked on aircraft technology development, creating microprocessors for airplanes. I also owned and ran a small helicopter sightseeing company. There is never much money in working for yourself—but I had *a lot* more fun.

I love recalling these adventures. They cover almost half of my life and are very interesting—to *me*. However, I doubt others will want to hear them. That's the odd thing about being a former astronaut: many of us spent less than a decade with NASA, even less time training for a flight, and mere days in space, and yet that time is all people remember us for. It's an understandable public reaction, but to live it is peculiar. To the public mind, we are frozen in time, decades ago, and nothing we do afterward really matters. We all dealt with that in different ways.

Some guys in the Apollo program believed that flying to the moon would change their lives forever. Did it? Hard to say, because theirs was a self-fulfilling prophecy. They had decided it would change their lives, so it did. It came to define them, as if it were the only worthwhile thing they had ever done.

Others seemed almost too blasé about it. When strangers asked Pete Conrad how it felt to journey to the moon, he'd shrug it off as just another flight—no big deal. I don't think Pete actually felt that way. But it was what a test pilot was supposed to say—that's what we do, we fly into the unknown and don't worry about what it means. *Of course* we did something special, Pete was saying through his casual stance, we were *already* special, an elite, handpicked team of top aviators.

I had what I felt was a normal reaction, somewhere between the two extremes. I was just a guy who had done a job. I felt proud that I had completed it and happy to have been in the right place at the right time. I didn't plan to spend the rest of my life living off the fading glory of my moment as an Apollo astronaut. But neither would I disappear into the background and pretend I hadn't been a small part of one of the century's finest achievements. I was proud of what I had done. Apart from how it had all ended.

The White House would invite Apollo astronauts to special events on occasion, but other than that I

didn't have too much involvement with the space program, past or present. I was pleased to be invited, but I still felt out of place. For the general public, the covers issue became a footnote while the great success of the Apollo 15 mission grew to eclipse it once again. I was happy for that. I felt that was how it should be. But public perception and private whispering are two very different things. A group of retired astronauts is like a bunch of high school kids brought together for gossipy reunions. We only all worked together for a short period in our lives, but the whispering about each other went on forever. And I felt I was still considered tainted. My peers no longer shunned me, as they had when I left Houston. But behind the smiles and the handshakes I sensed a continuing unease. I was the guy who had been fired. Perhaps I always would be to them.

I was successful in my post-NASA career. I was having fun. But I knew that my life should not have had this dark moment. And no amount of success, before or after it, could remove that nagging feeling.

While to the outside world we remained frozen in time, most Apollo astronauts went on to other things, many of them far removed from the space program. Dave finally left NASA in 1977, coincidentally, the same year the first *Star Wars* movie was released, featuring another *Falcon* spacecraft that flew just a *little* faster than ours. It was also a decisive year for Jim Irwin, but not for a good reason. Jim had his second heart attack while skiing in Colorado, not long after he'd had heart surgery. It took him off the speaking circuit, but once again, not for long. He soon jumped back into his busy evangelical schedule. I thought he was crazy.

That same year, I had my own tragedy to deal with. My father died in a horrific accident.

I had moved down to Palm Beach, Florida, by this time, and my parents followed me. They had sold the farm long ago and saved hard to move to a warmer state. They bought a home only ten minutes from mine. My father, now in his seventies, found another job as a movie projectionist. One afternoon he was driving some visiting relatives back to the Miami airport when he slammed into the concrete wall surrounding a toll booth. I received a phone call telling me that my mother and three relatives were in a Miami hospital, badly injured. And my father was dead.

At the funeral service for him up in Michigan, as my mother stoically received his ashes, I pondered the bitter irony. I'd lived a dangerous life, flying high-performance jets and a space mission. My easygoing father had always played it safe. And yet here we were at his funeral. I was glad I'd lived an adventurous life, because it didn't seem to make any difference in the end. If it was your time, it was your time.

My mother moved back to Jackson and the grim Michigan winters. She wanted it that way. The whole family pitched in and fixed up a beautiful home for her. And I thought about what to do next with my life.

I'd hardened a little over the years. I like to think I had grown wiser. I had always been self-sufficient, but I realized with increasing clarity that I had also been a very naïve and trusting person, too easily led by people I looked up to. It was time to do something about that. I'd try and lead instead of follow.

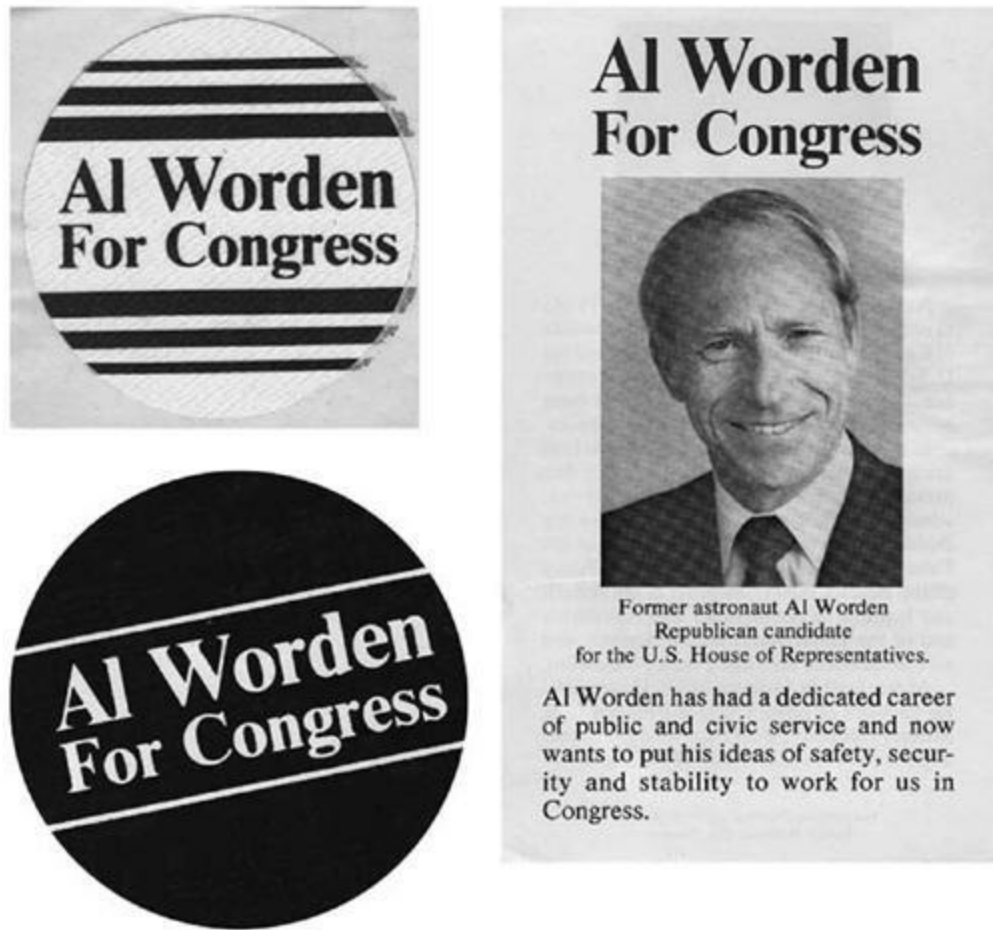
I had been giving talks in the Palm Beach area, and sometimes these conversations touched on the problems our country faced. People seemed to like my opinions, and many said I should run for political office. Not a bad idea, I decided. I would put my money where my mouth was, and even if I didn't win, people would at least understand I was serious. When a Florida congressional seat became wide open in 1982 because of a retirement, it seemed like the perfect moment.

Only 20 percent of the work of running for Congress is explaining your ideas to the public, I discovered. The vast majority is raising money. I enjoyed traveling the area and talking to people. But I had a hard time asking them to give me donations; it wasn't in my nature. But I raised enough. I grew

increasingly confident as I neared the primary vote.

I lost by a slim margin. But I was glad I had been through the process. It raised my confidence level, toughened me up some more, and gave me a new perspective.

The political process also brought me a surprising twist of good luck in my personal life. I had been adrift since a brief, unsuccessful marriage in the 1970s. Then a month after I began my congressional campaign, I met a widow named Jill Hotchkiss at a party. We hit it off instantly. Neither of us was looking for a relationship, but when you meet someone so funny, outgoing, and beautiful, it doesn't matter. In July of 1982, in the middle of the campaign, we married. My campaign manager wasn't happy; it would have been better for press coverage if I were a bachelor candidate. But Jill was more important than any campaign. We've been together ever since. I didn't win a seat in Congress—but I did win Jill. I looked to the future with confidence.



*Campaign materials from my run for Congress*

I had heard some other Apollo astronauts talk about a sense of peaking after their missions: a feeling that they had done the most significant thing in their lives in their late thirties. What could top flying to the moon? I didn't feel that way at all.

Going to the moon was wonderful, but in terms of personal achievement, it was a rote skill. It was something I learned how to do, like driving a car or flying an airplane. It didn't take much intellectual capacity. I needed to memorize facts and know what the machines told me when they gave me information. It didn't take a lot of creative thought. As a matter of fact, NASA didn't want creative thought on a moon flight; I needed to focus instead on what was written down, what the structure of

the mission was, and if all the systems worked.

I think the most important things we do in life are intellectual, not rote skills. Personally, running for Congress was a much bigger challenge than going to the moon. Where you stand on issues, how you live your life, and how much good you can do in the world are greater challenges than a lunar mission. I hadn't been successful in my political ambitions, but that didn't matter. I'd done my best to become a leader through the strength of my intellectual capacity and learned an important lesson. Just like athletes who have success early in life need to have ambitions for when they are no longer at the top of their game, I also needed to not peak early. I decided to find new goals and ambitions.

But first, I needed to take care of some unfinished business.

I had voluntarily turned over my flown postal covers to Chris Kraft during NASA's investigation on the understanding that I would get them back once it was concluded. I had followed all of the rules when flying my Herrick covers, so I knew they were my personal property. I had never surrendered my ownership of them nor my legal rights to them. Although NASA never told me they believed they owned the covers, they transferred them to the National Archives in August of 1973, along with the covers Dave had carried. The transfer paperwork stated that "these records are historically important and will probably be retained permanently." To remove them required the signatures of both NASA's administrator and deputy administrator. I wasn't informed.

In late 1974 the Justice Department finally informed NASA that no legal action against us was warranted regarding the covers. The investigation ended. The funny thing is that they could never find us guilty of anything. There was a federal statute against using government property for self-gain, but our actions were not enough to warrant its use. Poor judgment was the only charge that NASA could make stick, but that's not against the law. And yet the covers were not returned to us when we asked for them back. It appeared that NASA wanted us to forget about them.

At that time, I didn't push the issue. I still felt guilty and penitent. I knew I had screwed up and almost felt that NASA deserved to punish me. But as the years went by, I began to feel I had done my sentence and paid the price. In fact, with hindsight, I felt I had paid a bigger price than my actions deserved. NASA managers had wanted to make an example of me to my fellow astronauts and they had. But in the process, I thought that they had gone overboard to prove their point.

In December of 1978, the Office of the Attorney General quietly issued a memorandum opinion on the Apollo 15 covers and sent it to NASA. Among its conclusions, it stated that NASA had no legal claim to the covers as they were not purchased by public funds nor prepared at public expense. It also found that it was "routine NASA practice" to allow astronauts to carry covers into space. They concluded that Dave's failure to secure authorization to carry his covers was "inadvertent" and not enough cause for NASA to retain them. NASA's only claim to my covers, the report suggested, would be if I'd had a commercial arrangement to sell the covers with Herrick. I'd already satisfied investigators that I hadn't. The memorandum did query whether our crew should ever be able to profit from sales of the covers, but concluded that once we left NASA employment even that stipulation would no longer apply.

The memorandum was not a full exoneration of our actions, nor should it have been. But it blew apart most of the claims NASA had made to keep hold of the covers. Not surprisingly, the memorandum was not widely distributed. I didn't hear about it myself until October of 1981. When I did, I decided to take some action.

I felt that NASA had washed its hands of the issue by transferring the covers to the National Archives, which just didn't seem right to me. In fact, it felt like a violation of my constitutional rights. They had taken my personal property and placed it in the archives without following due legal

process. I'd been cleared of any illegal acts, but NASA's actions *did* seem illegal to me. I thought they violated my right of due process under the Fifth Amendment of the United States Constitution, one of my country's oldest and most venerated laws.

A decade after my spaceflight, I started to talk to lawyers, trying to find one to represent me. Many did not want to touch the case. It was too political, they told me. I would never be able to sue the government and win, even if I were in the right. Perhaps I should find a senator who would fight for me, they suggested. But I didn't want to drag the case into the political arena. I just wanted what was legally fair and just.

I could understand the lawyers' apprehension. After all, taking on the government is a big deal. Their reaction did give me second thoughts for a while. But eventually I found an attorney in Palm Beach who would take on the task. It took a lot of explaining to brief him on the intricacies of the events, but luckily I'd kept good documentation. In January of 1982, my attorney officially wrote to NASA and politely but firmly asked for my covers back. I hoped the request would resolve the issue. I really didn't want to sue NASA. Despite everything, I still loved them.

After a year of fruitless waiting, in February of 1983, we filed a lawsuit in federal court. We requested a jury trial. I was confident that any group of citizens would see the justice in my case.

A number of NASA lawyers contacted me, begging me to drop the case. Couldn't I see that I had done something wrong all those years ago? Yes, I admitted, I had made a stupid mistake. But two wrongs did not make a right. And I had politely asked for my covers back with no luck, so a lawsuit was my only option.

As the case progressed, I learned that NASA had actually wanted to give the covers back to us based on the advice of the Justice Department, but a number of congressional committees had been against the idea. I learned, too, that the Apollo 16 crew had also turned in their personal covers, and NASA had impounded them. They'd had no luck getting them back either. And an interesting precedent had been set in October 1977 by Ed Mitchell, who had sold one of the covers he took with him to the moon on Apollo 14. According to newspaper reports, some NASA officials were furious, but Ed was a private citizen now, so there was nothing NASA could do. He'd operated under the same lack of rules as our crew.

I was confident about getting my Herrick covers back. Then I discovered that there were even less legal grounds, according to the Justice Department, for NASA to hold the covers that Dave had carried for the three of us. Unlike the covers given to Sieger, they had not been created specifically to sell, only for us to keep. And unlike the Herrick covers, they had never left our possession.

Based on that information, in April 1983 I widened the lawsuit. I contacted Dave and Jim and asked if they wanted me to represent all of us to get those covers back. They agreed. Dave had made his own strong inquiries over the years pressing for the return of the covers and was eager to have them. Jim and Dave did not join me in suing the government, but they helped with the legal fees. If I lost the case, all they would lose was a little money.

NASA didn't help its case any by beginning to fly postal covers into space itself. The same year I filed my suit, NASA announced plans to carry more than two hundred sixty thousand postal covers on the eighth space shuttle mission in August 1983. They expected to sell them to the public immediately after the flight, make more than one and a half million dollars from the deal, and split the proceeds with the post office. I only learned about it after I'd filed my suit, but I was *very* amused by the coincidence. It made our little handful of covers look like no big deal at all, especially since NASA's covers were intended for unabashed commercial exploitation.

In May, my lawyers asked NASA for all documents relating to personal items carried on Mercury,

Gemini, and Apollo flights and their distribution and current whereabouts. We asked for the dates that each item had been given to a person and where it was now. It sounds like a simple request and was of obvious relevance to my case. In theory, it should have been easy for NASA to comply. But, of course, they'd never kept track of the items astronauts personally carried. They also had very little information about the tens of thousands of items given over the years to public officials. From the president on down, recipients could have sold their gifts long ago, given them away, or passed them on to someone else. In a jury trial, those individuals—including the president—could be called to give important testimony. We planned to depose many of them.

I also asked NASA to produce any and all official orders, directives, and memoranda on PPKs up to and including the time of my flight. If there were rules, I wanted to know what they were. If there were no rules in place, a jury should know that, too.

Given the difficulty that our simple requests would have caused NASA, I wasn't surprised when the next response was an offer to settle the case.

The settlement agreement between me and the government was finalized on July 15, 1983. They agreed to completely and unconditionally release all the covers to us, at which time my legal counsel would terminate the lawsuit.

As part of the agreement, the three of us on the Apollo 15 crew also agreed not to pursue any further liability against the government in the matter of the covers. It was called an "amicable resolution." I'd seriously considered saying no to the deal and pursuing a claim for damages against the government for the seizure of my property. I thought I had a strong case and think I would have won a substantial settlement. But, on reflection, that wasn't the reason I was doing this. I did it to resolve a painful episode in my life and move on.

Dave and Jim had awarded me the power of attorney to pick up their covers. So on July 29, I headed to the National Archives in Washington, D.C., for a morning appointment. The covers were in storage, right next to the Warren Commission report on President Kennedy's assassination. They were brought to me in a small storage box. In the corner of that mostly empty box was a little pile of postal covers. I placed the box on a table the staff told me had been used as part of the surrender ceremonies at the end of World War II, and I signed my own peace treaty with the government there.

Jim and Dave met me at the archives, and we strolled to a local Irish pub. Over a drink, we divided up the envelopes as agreed. At last, our personal, private property was under our control again, to do with as we wished. It was a peculiar final meeting as a trio, sharing a meal and passing envelopes around. To my recollection, it was the last time the three of us were ever in the same room together.

I had just done Dave and Jim a big favor. Getting the covers back did a lot to clear our names at long last. The newspaper coverage of the settlement used phrases such as "proved themselves right and blameless," and "after eleven years they'd been vindicated." Nevertheless, it did not feel like a time to celebrate.

Suing my former employer had been a bitter experience. I didn't love all of the managers at NASA, but I still loved the work they did, especially now that the space shuttle was flying and the space program was rolling again in a way that it had not done for a decade. Now we'd settled all of our differences. Then, as the people I disliked retired or moved on and the covers issue receded into ancient history, my relationship with NASA grew warm and cozy again. Today, it's better than ever.

Dave was very pleased with me. And it was oddly satisfying to be the crewmember who took the lead and sorted out the mess. But ten years of reflection on the events surrounding my firing had changed my feelings toward Dave. My deep admiration for him as a spaceflight commander was still

strong. My feelings about him as a person were quite different. I didn't feel particularly friendly to him. And in the quarter of a century that has passed since we sat there having a drink that day, I have rarely felt otherwise.

For better or worse, for richer or poorer, we'll always be a crew. When I give public presentations, I proudly wear a jacket with an Apollo 15 patch on it; Dave's and Jim's names are right there on my chest next to mine. We'll forever be a team who accomplished an amazing flight. But that is where it ends. I am happy to talk with the public for hours about Dave Scott the outstanding astronaut whom I trusted with my life in space. When it comes to the individual whom I followed just as eagerly here on earth, now that I have written this book, I doubt I will give him much thought for the rest of my life.

Jim, on the other hand, I still loved like a brother, and I met up with him whenever I could. I admired his energy, but I worried about his health. He kept up that relentless speaking schedule. It seemed he was in a different corner of the world every month, spreading his religious message. He slimmed down and jogged five miles a day to try to stay healthy, but in the end it wasn't enough.

On August 8, 1991 I received a phone call from a mutual friend—the message I had long dreaded. Jim had suffered another heart attack—and this time it was fatal. He was only sixty-one years old.

It was a shock for the NASA community. Only twelve people had walked on the moon, and now the world had lost one. I attended Jim's funeral in Colorado Springs—an odd experience, with a chapel full of well-known televangelists orating at length about a man they barely knew—and hoped it would be the last astronaut funeral for a long time. It wasn't. In that same decade we lost four other guys who had flown to the moon. Time was catching up with us.

In 1997 I retired from a great technology acquisition job in private industry and was ready to work for myself again. Then I received an unexpected call from NASA. Jack Boyd, a senior manager, had an intriguing offer. Would I like to come back and work for them?

Ames was creating a new aircraft division, and Jack wanted me to be in charge of all of NASA's airplanes for the entire western half of the continent. It was an outstanding job and a great pay offer. I was deeply tempted. So I headed out to Ames, where I would be based once again and started to look at houses. But since I had left, the area had grown more and more as a high-tech hub. The high-paying computer jobs in Silicon Valley had accelerated the house prices astronomically. With regret, I had to turn down the job; I just couldn't afford to live there anymore. Nevertheless, it meant a lot to me to be asked back. My journey to repair my self-esteem was almost complete. Only one challenge remained.





## CHAPTER 14

### A NEW TRANQUILITY

My mother lived through it all. In 1909, when she was born, people struggled to fly across the English Channel. It was only six years after the Wright brothers made their historic flight. She lived to join me in celebrating the thirtieth anniversary of my flight to the moon. Yet none of the advances in technology meant much to her. She remained the same stoic farm girl she had always been, heading the family and directing our social events. Eventually she needed daily nursing care, but she still remained fiercely independent. She stayed active until the end, but eventually she just wore out. At the age of ninety-four, she faded away.

She had taught me self-reliance, something that had served me well throughout my life. Nevertheless, although I *could* operate alone, I still wanted acceptance from my peers. I'd fixed most of the pieces over three decades. I had resolved the covers issue. I'd made friends with NASA again. But I still hoped for the acceptance, even the forgiveness, of my astronaut peers.

When I moved to Florida in the early 1980s, I became involved in the local Boys' Club. They did great work inspiring kids who needed help in life. Each year I would try to bring astronauts out to help with their annual fundraising event. One year I managed to assemble nineteen of us, including the Apollo 11 crew.

Then, in 1984, I heard that the surviving members of the original Mercury astronaut group were creating a foundation, the Mercury Seven Foundation, to provide scholarships for college students who exhibited exceptional performance in science or engineering. I liked the idea of helping the best and brightest through college, knowing they could make a real difference to future innovation.

So I got in touch with Al Shepard, the astronaut who was driving the project. Put me on the board, I suggested—I can help. I'm not sure he thought much of me, but as I lived close to the Cape, where most of the foundation's activities took place, eventually he put me to work. I suspect my appointment was simply because I was close by, so I could be tasked with some of the less glamorous chores.

The Mercury astronauts were older than my astronaut group, so as time went by my peers needed to assume more of the responsibilities. Al passed away in 1998, and the foundation widened its scope to become the Astronaut Scholarship Foundation, known as the ASF. In 2005, I was elected to chair the foundation.

The first year the Mercury Seven Foundation gave out scholarships, they awarded a total of seven thousand dollars. Over the years we've grown to the point where we have now awarded more than two and a half million. At a time of life when many people have retired, I work harder than ever, aggressively courting sponsors and colleges so we can help more and more students every year. We're trying to pick kids who will make a huge difference two decades from now. Perhaps they will take us beyond the moon and out to the planets. Perhaps they will help provide the world with clean

and renewable energy or help us to restore our Earth's fragile environment. I don't know. I *do* know that their achievements will be important and impressive.

The ASF is based out by the Cape, so most weeks I am back at the site where I launched to the moon decades ago. It's an exciting place, and the only launch center in the world that I know of where you can drive up, buy a ticket, and see everything that goes on. There's a great visitor center stuffed with spacecraft and other items from the long history of spaceflight. Every day of the year a former astronaut is there to give a talk to the public. Quite often I am the speaker. I enjoy talking to people and watching them explore the place, learning as they go.

Anytime the folks at the Cape need something, I am there. Because of my proximity, I make more public appearances there than any other Apollo astronaut. It's a little ironic; I am promoting NASA and their work almost every week, much more than most of the guys who finished their astronaut careers with honor. But I love NASA and what they do. Many of the people working there weren't even born when I was an astronaut, and they couldn't be a more enthusiastic and hardworking bunch.

It is still a thrill for me to watch a launch. Recently, that's been the space shuttle, including one named *Endeavour*, just like my spacecraft. Much of the time I watch the launches up close from the Cape. But sometimes I just stroll across the street from my home down the coast and, standing on the beach with a drink in my hand, watch that bright fiery glow as it leaps into the sky and arcs away into orbit. If I feel lazy, I can even see them launch from my backyard. It never gets old.

I wasn't far from the Cape one cold morning in January of 1986 when, stopped at a gas station on my way to Orlando, I watched the *Challenger* spacecraft make its last flight. I'd seen enough launches to know that something had gone terribly wrong when the solid rocket boosters suddenly separated, and the clean thin line of launch exhaust twisted into an expanding orange ball of gas. Standing in that gas station, I'd just witnessed a tragedy that killed seven astronauts.

I wasn't far from home, so I raced back and turned on the TV. As soon as I learned some of the details, I felt the need to get up to the Cape. There were many people I knew there, helping to console the grief-stricken families. I tried to do what I could to assist. Most people just wanted to talk, just like they had after the Apollo 1 fire. It was one of the saddest days of my life.

In my day almost every astronaut was a test pilot, and we understood that accidents could happen. The shuttle was different: many shuttle astronauts came from academic science and engineering backgrounds, and *Challenger* even had a schoolteacher on board. Few were prepared for the possibility of death.

Seventeen years later another group of families waited at the Cape, looking for the *Columbia* space shuttle to glide in for a landing. I, too, was standing outside a store in a little town west of the Cape, scanning the skies in vain. The shuttle never made it home. Spaceflight will always be a dangerous and unforgiving business.

It just made the get-togethers we had as astronauts even more meaningful. The ASF has now become the focal point for reunions of old colleagues. Retiring shuttle astronauts have swelled our ranks, but that doesn't lessen the impact of losing more and more of the original guys. Every couple of years, it seems, there is one more funeral, and one more voice I miss.

I had known Wally Schirra for almost forty years by that point, and his sense of fun never diminished. He was always full of jokes, particularly those sneaky "Gotchas." So when the ASF organized a riverboat cruise down the Mississippi River in 2004 to raise money, I decided it would be the perfect opportunity to pay him back.

I was on the cruise with three of the original astronauts, Wally, Scott Carpenter, and Gordo Cooper. Paying guests joined us on the ride to raise tens of thousands of dollars for the foundation. After two

days on the river, we were ready to play our trick.

Scott, Gordo, and I hid in the bathroom of Wally's guest room. The hotel manager and his female assistant climbed into Wally's bed in what looked like a *very* compromising position. Then the ship's host showed an unsuspecting Wally to his room.

Wally turned on the lights and let out a yell. The woman on the bed looked back at Wally and screamed so loud it could be heard the length of the ship. Wally jumped in shock, and stood there, frozen in surprise, his eyes wide. Then the manager in the bed looked at him and said "My God, you are Wally Schirra, the famous astronaut." Reaching over to the bedside stand he picked up a copy of Wally's memoirs, held it out and calmly asked, "Would you mind autographing this for me?"

That was our cue to burst out of the bathroom, as everyone in the room collapsed in laughter. Wally had to admit it was a world-class Gotcha.

Gordo passed away just a few months after the cruise. Three years later, we lost Wally. I was saddened but also gratified that my last memories of my astronaut colleagues are so positive and fun.

It might seem silly, after all these years, but when one of my colleagues turns to me after a successful ASF event and casually says, "Nice job, Al"—perhaps with a slap on the shoulder, too—it means the world to me. I let them down decades ago. Now, for the first time since my spaceflight, I'm getting those little nods of approval, a sense of *belonging* once again. It probably means more to me than to them, but that's okay. I've completed the circle. I'm at peace.

My family thinks I am crazy to work so hard at a time of life when many people take it easy. But earning back this friendship and trust is perhaps the deepest and most driving force I have ever felt in my life. It's something that I *have* to do.

As I explained earlier, I think running for Congress was more important to me personally than flying to the moon. When it comes to my public legacy, I think my work with the ASF will have a much greater long-term impact than my lunar mission. Going to the moon won't be the most important thing in my life. If I can help a thousand of my country's brightest students through college, they will make an enormous difference to the future of the world. That work is what drives me today. How can I retire?



Once I began to regain the approval of my colleagues, there was only one final step left for me. I needed to write this book. Forty years was a long time to hold in the full story. I didn't have to wait that long. But I came from a large family where I learned to roll with the punches and try to get along. Not only did I not write the story down, I also didn't talk about it with the public. When interviewers asked me about leaving NASA or the covers, I gave general answers with little detail.

But four decades is long enough. At some point the true story needed to be told. Now it's done. I can look back on my moon flight with no lingering sense of unfinished business.

I still love to look at the moon. I think the moon is very comforting. When it rises, you know all is well.

I look at the big dark circles on its surface and think about how they got there. I wonder what the moon must have been like four billion years ago. I also try to imagine what Earth must have been like that long ago. It still amazes me to see that enormous ball out there floating around Earth, circling, always keeping the same face toward us.

Outside of those observations, I don't dwell on the fact that I've been there. The moon is such a tiny step for humans; I am waiting for us to go somewhere that *really* means something. I have become convinced that there is a genetic drive in us that says we have to go into space. Why? Not because we want to visit Mars, but because someday we will have to find a new home. Our sun won't last forever. We'll need to protect the species by going somewhere else. We may have to travel enormous distances, so we had better begin learning how to do it. If we don't start now, we'll never get there.

In the meantime, I think about Earth. Having seen it from a distance, I appreciate what a finite object it is. I plan to focus on what we've got here, far more than what is out there.

Of all the places I have traveled, it is still hard to beat a Michigan summer. I like to walk in the woods and fields, just as I did as a kid back on the farm. Except now, I'm not alone. On a warm evening I'll be with my children, and *their* children. Sitting on the grass, I can feel the living soil as I rest my hands on it. There's new life there, new potential, waiting to grow. It's comforting.

Sometimes, while I sit and enjoy the good company of my family, the moon will slowly rise above the trees. I generally don't pay it much thought. But occasionally I am reminded of my brief glimpse into infinity while alone on the moon's far side. I still have lingering questions about what I experienced. The answers won't come in my lifetime. That will be your job.

Try it, sometime. Some day all of us who journeyed to the moon will be gone. Take a walk on a summer night, look up at the moon, and think of us. A part of us is still there and always will be.



## EPILOGUE

As a senior, veteran astronaut at the time of the Gemini, Apollo, Skylab, and Apollo-Soyuz missions, over the years, I have encouraged the crew members of those flights to write down their insights of their participation in history's greatest achievements and adventures. The Apollo 15 crew explored the moon, both on the surface and in orbit, and flew one of the world's greatest scientific expeditions. Al Worden did a superb job as a vital member of that crew. I am pleased he has finally shared his story.

After I commanded the Apollo 10 mission to the moon, I replaced Alan Shepard as chief of the astronaut office, followed by a promotion to deputy director of Flight Crew Operations. I was involved in numerous key decisions made behind closed doors about who would fly in space and who would not, as well as issues surrounding astronauts who had bent the rules. In the early days of the space program, we determined that it was best for the program to keep these decisions internal and informal, not passed up through the chain of command to the top bureaucrats. In most cases, they wouldn't want to know some of the issues that involved astronauts, nor would they probably have understood the best course of action.

Any organization, after its first fresh and lean years, tends to become more bureaucratic, and NASA was no different. At some point, the days of astronauts with a large degree of autonomy and influence were bound to fade. The difference between the authority of the original Mercury Seven and today's NASA astronauts is striking. The question was never *if* the change would happen, but *when*. And change did happen, over a period of many years.

After several incidents toward the end of the Apollo program, the bureaucrats moved in for good. Many of them felt for years that we astronauts had far too much power, prestige, and responsibility. Things were never as informal as they had been before. NASA changed and lost some of its original pioneering and engineering spirit. All of the rules were now laid out in black and white, and every decision passed through multiple layers of middle and upper managers.

Al Worden brought his talent to NASA during a time when the balance had started to shift. Deke Slayton was the director of Flight Crew Operations, and as part of his duties had capably managed the astronauts on a basis of trust and personal responsibility. Al, too, was a trusting guy and had no reason to doubt his superiors. After approving Al's selection as an astronaut, Deke Slayton gave him one of the earliest flight assignments in his selection group—backup for Apollo 12. It was obvious that Deke thought a lot of him. When it came to carrying out his flight duties, Al performed superbly.

The nonflight issues surrounding the Apollo 15 crew were traumatic for Deke and the entire Apollo community. The events ended Al's astronaut and military career, and it is unfortunate that he feels it tainted his name for decades. Personally, I always thought he was an outstanding individual and test pilot, going back to our first meeting, and my opinion of him has never changed. The Apollo 15

mission should be remembered primarily as a perfect flight, greatly advancing our scientific knowledge of the moon. The crew did a great job of flying all aspects of their challenging mission. Al should not have his efforts degraded by the decades-old, short-lived publicity surrounding some postal covers carried on board.

So, I'm delighted that Al has finally chosen to document his experiences and relate the outstanding success of his Apollo 15 mission to the moon. As one who commanded a mission to the moon, flying the first lunar module to orbit low over its majestic surface, I can relate.

Lt. General Tom Stafford, USAF (Ret.)  
Pilot, Gemini 6A  
Command Pilot, Gemini 9A  
Commander, Apollo 10 and Apollo-Soyuz  
Former Chief of the Astronaut Office



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I've tried my best to describe people and events in words; however, I know there will be places in this story where a reader would like to see a photo. As there is only a limited amount of space in the book, I have added more photos to my website—[www.alworden.com](http://www.alworden.com)—from my life today back to my childhood. I hope you enjoy them.